GEOGRAPHY

HIGHER SECONDARY

SECOND YEAR



TAMILNADU TEXTBOOK SOCIETY

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INTRODUCTION

Natural Environment and Man

The natural environment is significant to all living things including man. It sets forth conditions or limits which the living things have to accept. In the case of man, he developed his economic activities in stages from the simple food gathering and hunting stages, where he showed utter dependence on nature through herding and nomadism, shifting cultivation, agricultural, mechanical, technological stages effectively, where he harnesses nature at his will. The natural environment is, therefore, important in two ways. Firstly, it is the home of man. Secondly, it is the store house, the source of all the raw materials, biotic, organic and inorganic minerals and energy, which man uses for his service to live in comfort and convenience.

Physical Setting

The physical setting is fundamental to the natural environment. The high mountains, whether in chains or groups or single, snow-capped and running into thousands of miles are awe inspiring and impassable till they are conquered by man. The huge plateaux including the Tibetan plateau, 'Roof of the World', are not quite so formidable but for greater part they do not attract men in large numbers to settle down.

River System

The great river basins on the other hand have played very significant role in nurturing the human civilization and sustaining millions of people, whether they are the sacred rivers of India or the twin Euphrates and Tigris that moulded the Fertile Crescent or the mighty Nile, or the mighty rivers of China support which to-day the highest population densities in the world.

The gigantic rivers of South America make the Continent the wettest in the tropics. The Amazon carries the biggest volume of fresh water into the Atlantic, but serves rather a scantily peopled

basin. All the rivers of this Continent can be linked by short canals that will make communication by water possible from the Lake Moracaibo to the La Plata estuary. To a large extent the European river systems have already been linked.

Man owes so much to the rivers that serve him silently and support him in a wide variety of ways. The rivers of North America are also unique; in a number of ways they have gained prominence. The Niagara excels all the waterfalls in the world including the Victoria Falls on the Zambezi in its grandeur, accessibly purposeful service and its popularity as a tourist resort serving all the nations of the world. The T.V.A. on the Tennessee is a model for several river valley corporations for making multiple use of the rivers for HEP development, navigation, recreation and inland fisheries. The deltas of the great rivers including the deltas of all the monsoon rivers have indeed served humanity. But, sometimes floods destory villages, man and his property and leave desolation, destruction and destitution behind. After the river basins and deltas some of the coastal plains 0' to 500' in the Orient carry the heavy densities of human population. The nearer example to us is the Kerala coast and the Cauvery delta with more than 2000 people per square mile.

The agents of weathering and denudation have been silently bringing about subtle changes all over the world, that to-day, if there is anything permanent in the world where the work is going on persistently.

Geomorphic Landscape

The sculpture of the land forms by running water, glaciers, winds and ground water, and volcanism that are relatively more spectacular and some of the resultant forms are unparalleled. The outbursts of basic lava spreading over several hundreds of square miles on the surface like the Deccan lava or the Snake-Columbia plateau or the disappearance of island like the Krakatoa, or the emergence of the Hawaiian group of islands from the Pacific Ocean floor are some of the spectacular geographical happenings that have influenced the physical setting of the natural environment.

The environment is all around us and we are participants in the environment. Our presence in the environment is purposive.

We are present in a particular place because of our work and engagements that we are thus involved. With the tasks we are performing within that environment that relate us to individuals and social groups, institutions, and material things like buildings, appliances, furniture, tools etc. considerable advance has been made on the inter-action of environment and behaviour due to processes of which three are important, heat, light and noise.

Environmental Influences

The influences of the environment on men are many and varied such as the effect of space and buildings and people. Psychologically speaking, people bring to their surroundings as much as they take from them. Attitudes, expectations, habits and skills interact in the physical environment. For instance, thermal comfort at any temperature relates to the individual and the activity in which he is engaged. Our environments interact with our emotional responses and with the determined courses of our action.

Acclimatization

High temperatures increase ability to sweat. The human beings by their basic metabolic activities produce quantities of heat which they pass on to the environment by radiation. Noise pollution affects man in the urbanized area and is one of nuisance value that is growing. The environmental noise due to rise in pitch during the past fifty years is due to progressive change. Some individuals are not perturbed even in really difficult situations though general noise is a source of annoyance. Noise sensitive and noise tolerant groups are identified in urban areas. Non-manual workers are more significantly susceptible to noise than manual workers. In fact, a person, who is sensitive is likely to be creative and belongs to high intellectual life. On the basis of reaction to noise, people belong to three groups, namely, noise sensitive, normal and noise tolerant. In residential areas, industrial noise, road traffic noise and aircraft noise are of constant frequency.

World Resources

Resources are the foundations of power, wealth and prestige and affect the destiny of the individuals, societal groups and

nations. The U.S.A. is the most gifted country, in that, it has abundant supplies of land, water, energy and other mineral resources. To-day, it is the foremost in the world in the development of its industry and trade.

Over Population Drains Resources

In the pre-World War I period, the eminent economists and political thinkers like Malthus dwelt on problems of population and resources. With the emergence of the U.S.S.R. and her new concepts in 1921, the world heard of new methods of planning and developing national resources in a country which did not recognize private ownership. The U.S.S.R., the centrally governed country, established State ownership of all the resources and all developments for the State and its people, who in turn work for the State. Thus, for the first time in human History, the government of a people controlled all the resources for the State and its people.

Widening Horizons—Conquest of Space

The Earth's land surface cannot be enlarged. It is an established fact that neither the Moon nor any of the planets is suitable for colonization. Colonising space for human expansion is out of question because of the prohibitive cost. Therefore the world population that is growing at a phenomenal rate must be checked and controlled. It cannot be allowed to continue at the present rate of 2 per cent per year whereby it will double itself every 35 years. Land surface on earth is limited but man's habitat is necessarily to be confined to this earth. Space and satellites will assist man in other ways but not to absorb surplus population. Man has to deny himself the prospects of colonising space. He cannot live in space. But he is already communicating through space satellites orbitted by the nations of the world including India. This system of communication is available to all the developed countries. It is the quickest and the most efficient.

Nature and Culture

In our evolving civilization, cultural changes become dynamic and develop at different levels. Each level calls for and is related to different resources. Nature sets the limits within which man

has to develop his art and culture to satisfy his wants and satisfactions are conditioned by resources and human effort. Human culture is adaptive and reflects adaptation to natural advantages and disadvantages.

The New Philosophy—Resources and Man

The First World War saw the end of certain old ideas of governments and the emergence of a new social order. The U.S.S.R., made known to the world the new philosophy and political economy and the new type of partnership between the Government and the people in relation to the duel role and development of the resources of a country. For the first time in human History, the centralised Government of the Soviet Republic controlled all the resources of the country for the Soviet people. The new concept changed the concept of property and private ownership. The resources belonged to all the people of the country in developing in which the people entered into partnership with their Governments.

Human Powers—Environment

Human resources, commonly referred to as human powers may also be insured and conserved, and like all other resources put to proper use. They are analogous to natural resources. They can be developed, depleted, wasted or reduced in productivity. Human powers can be trained and developed to higher intellectual levels. The human brain can work at a high level of efficiency and the hands adapted to teach, to guide, to shape, to plan, to promote and above all to serve human society.

All resources, organic and inorganic, are in turn fundamentals of power, wealth and prestige. They affect the destiny of the individuals, social groups and nations. At present, the World's foremost nations are those who have abundant resources in the form of extensive land and water resources, biotic, metalic and non-metalic energy. Utilizing them in a wide range of ways, these nations have built up their complex Industrial development programmes and trade relations, economic, social and political relations. The U.S.A., the U.S.S.R, the U.K., Germany and Japan are amongst the most important of the developed countries.

Planning Resources

The more highly and fully trained they are the better the people are equipped for planning for progress. With the advance in Science and Technology every developed country is training specialists, whose services are used elsewhere, particularly in the developing countries. The significance and utilization of human powers and intellectual resources hardly need any emphasis. The developing countries need teams of scientists, technologists and specialists to plan and implement developing programmes.

Science and Technology have given unlimited scope for specialists. The conservation of human powers means that there should be planned utilization of the best brains and the best talents for the service of mankind.

The Earth's Limited Resources

The Earth's land surface is limited. It is only 29.2% of the globe. It cannot be enlarged. It is now an established fact that neither the Moon nor any of the planets of the Solar system is suitable for colonization by man. Colonising space for human settlements is out of question, because of the prohibitive cost. Therefore, the world population is growing at a phenomenal rate of 2 per cent per year. Our planet is not invulnerable; neither are its resources inexhaustible except Solar radiation which is unlimited, but even sunshine can be adversely affected by pollution. The pollutants cannot be easily removed. They do not stay where they are introduced. They spread and get diffused far and wide, to distant parts of the Earth. The DDT, for example, that the civilized world uses so freely and lavishly for agricultural operations and are also sprayed from air to control pests and insects, eventually find their way to the water patches and oceans where they affect marine life. It has been proved that the DDT pollution has affected the penguins of the Antarctica.

The use of similar chemicals and detergents will act slowly to destory life on Earth and water for man to live a full life. But there are major conflicts among the super nations and cold wars are indulged for gaining supremacy that may lead to confrontations and Global Wars. The super powers at one end are planning thousands of welfare schemes for mankind at a cost of billions of

dollars. On the other hand, programmes for armament production, space conquest and military bases speak of plans for genocide.

The latest information on the total population of the world and some leading countries is extracted from 'the Hindu' dated Saturday, the 18th of November, 1978, which is as follows:

TABLE I

		(*in Billion*)
The World	...	4.365
China	...	1.004
India	...	0.656
The U.S.S.R.	...	0.261
The U.S.A.	...	0.230
Indonesia	...	0.149
Brazil	...	0.122
Japan	...	0.115

The latest figure of world population indicates an additional 59 millions over the estimated figure a year ago. The growth rate is 2 per cent which is the same as that of last year. The highest growth rate is from United Arab country which is 8.9%, Kuwait's is 5.9%, Libya's is 4.1%, China's growth rate is 2.3% and India's is 2.1%. The estimated population of the paleolithic man about 15,000 years ago was about half a million and that of neolithic man was about one million. It has taken man 15,000 years to multiply from one million to 4.365 billions on this Earth, where the land surface has not increased by an iota. Thirty-five years hence the world population will be about nine billions, that is, by 2000 A.D. But the accepted growth rates in Africa and Latin America may put the figure even higher.

Man—World's Greatest Resource

Of all the resources of a country the population stands foremost. Man is our main concern. Man through his superior brain and articulate speech records his experiences and accumulates knowledge. The greatest of all human resources is knowledge, which is wrought by man's thinking and reasoning. Man built up his complex civilization, by harnessing Nature by scientific

discoveries and technology. The same Science and Technology can be used by man for his self-preservation and for his destruction and the erasement of his culture that has taken at least 10,000 years to develop. What is it that mankind is now planning and living for ? Is it for a world with prosperity for posterity or total

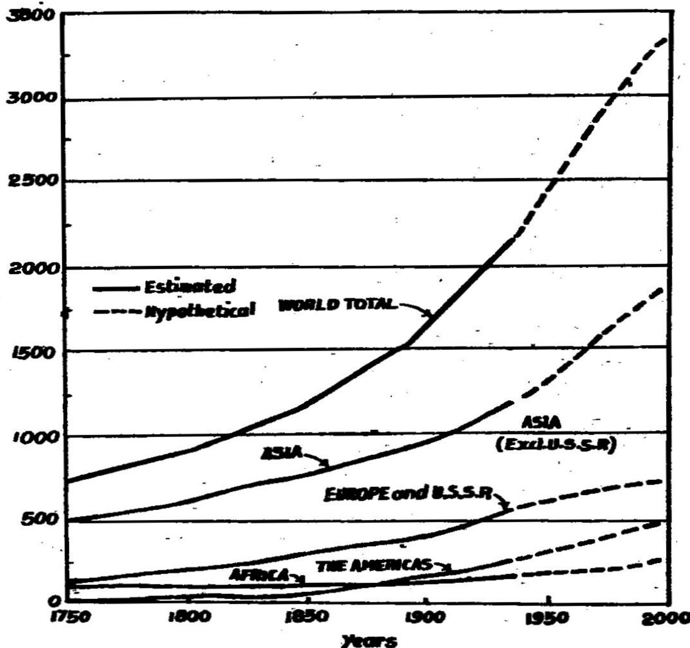


FIG. 1. Estimates and Hypothetical Populations of Major Sections of the World—1750-2000

annihilation of the Earth, which is the only planet and which is the home of Man? In his own interest, in the interest of preservation of human race and therefore, the preservation of the Earth, Man should act now. If not now? When? If not Man? Who?

Man's Impact on Environment

Plant life needs certain chemicals in small proportions. By and large our agricultural practices largely depended on organic

and farmyard manures. The nineteenth century saw the increasing use of nutrients to increase yield. In the twentieth century it became widespread to keep pace with the growing population numbers and food shortages due to calestrophic crop failures and due to droughts or floods. In the post World War II period yields were doubled and trebled due to use of chemical fertilizers. This caught the imagination of farmers in many countries and by the 1960's the annual use of fertilizers exceeded 35 million metric tons. Before long the world discovered that fertilizers applied to crops could increase yield as well as destroy. The chemicals in solution found their way to lakes, ponds and streams and ultimately the oceans where they fed the fish. The DDT killed the insects and mosquitoes, but ended in collosal damage to the fish and shrimps. The DDT was found, far from the place of its application in the seeds, in the high altitudes and penguins in the Antarctica. It is highly possible that the DDT and its residues are widely distributed throughout marine biosphere. The teeming fish of the ocean and the chain of life thus are imperilled.

Conservation of Resources

The quality of human life and destiny of man on this earth are directly related to basic population problems in a limited environment with limited resources.

It is the new products, new industries and their nature that have created an acute drain on some resources. The economic outlook of the world is at cross roads. The East and the West are evolving and developing at different stages of social and economic evolution. Their philosophies are different.

History of Conservation

The world paid no heed to resources till the situation arose and it was first felt in the U.S.A. in the nineteenth century. For further expansion of human settlements in the eighteenth and in the early nineteenth centuries the American citizens cleared forests, depleted minerals and fuels. The significance of oil as a vital resource was appreciated and its limitations were felt. The automobile became the major prestigious factor in the nations' social and economic life. The nation was becoming increasingly aware of the shrinking resources.

It is the new products that are the outcome of new industries and their nature that cause much of the pollution as well as acute drain on the resources. The production of synthetic fibres increased 2000% in the post war period, while all other natural forces increased only by 6%. Synthetic detergents to a large extent compete with soaps and in the advanced countries have replaced soaps. Synthetic rubber tends to drive out natural products. The plastics have taken the place of wood and paper products. The shift from the natural ecological processes in two decades had devastating effect on the environment and on the natural resources. The new technologies are the primary cause of the deterioration of environment and cause destruction. The Earth's dire situation is the result of 5 major factors. (1) Population, (2) uncertain and shortage of food production, (3) industrialization, (4) rampant pollution and (5) consumption of non-renewable natural resources.

Government policies for planned parenthood definitely will limit population as in the case of Japan.

Green Revolution and devices to control pests will chase hunger from the Earth.

Moderation in mechanization in agricultural products will keep down the pace of unemployment.

Superior controls are necessary to arrest population.

Reduction in the use of synthetics and controls on their industrial production will conserve natural resources.

Untrammelled economic growth is the present world goal. Industrialists and economists expect to record a growth each year, a rise in production, output and profit in achieving their goals irrespsective of all other considerations.

In 1908, the American President Theodore Roosevelt launched the campaign for conservation of natural resources. A reversal in the national attitudes he felt was vital and necessary. He aroused great enthusiasm in the nation. Conservation became an accepted preamble to be controlled by the Government. It was accepted that

1. Stronger control of resources by the Government.
2. Recognition of Public Health and steps to be taken to stamp out health hazards.

3. Conservation of Wild Life, soil, water and all other resources.

The necessary interpretation of conservation led to classification of resources and their surveys as well as elimination of wasteful methods of exploitation and utilization of resources. Further, it called for the reorientation of the economy of Oil and other resources of specific natures in the U.S.A. Fuller utilization of scrap metals to reduce the acute drain on virgin metals was accepted to meet the fresh demands on metals.

Conservation is an investment for the future in a world where the population growth is phenomenal and is doubling itself every 35 years and the resources are dwindling at staggering rates. Mankind now realises that conservation is to the greatest good to the greatest number and for the longest time.

Our Evolving Civilization vis a vis Conservation

After the First World War, as stated elsewhere, the world became aware of new strategies, liberalism and socialism. Mahatma Gandhi has advocated Sarvodaya, 'One for all and all for one' and emphasized eradication of poverty and illiteracy and unemployment and to ensure dignity to every man. The UNESCO advocates 'Education is the birth right of every individual born in the world'. The Soviet Union has given the world the method of planning the resources. Conflict in interests of industrial and non-industrial, white and non-white are wide spread. Series of planned programmes are afoot to evolve international approaches towards a one-world concept, political, economic, social and cultural problems. World trade, travels, tourism are making positive contribution to draw the world nations closer in understanding. The international languages like English, sports like Cricket, mass communication like radio, T.V. and wireless are severally and jointly forging towards the same end.

Conservation—The New Attitudes of the Youth

For the past two or three decades the youth of the world have been awakened with new attitudes and demanding privileges and rights. They want opportunities for participations in all matters

relating to their future and their educational training and welfare. The World elders now grant that the youth must be granted recognition and get their share of partnership in major responsibilities in designing the national, educational, social and cultural programmes, and also their share of representation on administrative bodies including the Universities. In India the National and State Governments recognise the vital role the youth may play in the development of the nation. They are now involved in the NSS, NCC, and Block Development Programmes. When the youth take up the reins to control upsurgence, restlessness and strikes in Colleges and Universities, there will be greater discipline and dignity in the institutes of higher learning and better academic standards of achievement.

The youth are to be educated to look to a future that makes provision for all forms of life besides man and for the environment where he has to live. It is hoped that in the new strategy for conservation of natural resources all forms of life that have vanished from the environment of man through extravagant and thoughtless exploitation will rejuvenate and the ecosystem will restore the overall forms including wild life. Given a chance nature will regenerate what was lost in a short span of two hundred years what nature has built up for thousands of years. Conservation is now needed to preserve nature's gifts for the generations to come.

We are the custodians of our land resources and other resources. While we enjoy them it is our responsibility to manage them and hand them over to the future generations in a better state than we have found them.

Conservation is an investment for the future. In a world where the population of the world is doubling initself every 35 years and the resources are dwindling mankind will have to realise that conservation is for the greatest good to the greatest number and for the longest time.

Environments and Religions

Modern man plans for more than basic wants in the form of food, clothing and shelter. Basic education and job-oriented training are now recognized as important acquisitions in order

that he may live with satisfaction in this competitive world. Self expression through the development of talents in fine arts, music, dance and drama and intellectual furtherance of personality are becoming increasingly universal. MAN DOES NOT LIVE BY BREAD ALONE. He has insatiable hungers and thirsts with a loving heart, giving hands, thinking and reasoning brain, perceiving vision, conceiving brain, mobile feet and above all aspiring soul. The human being is not just physical. There are other components like the mind and soul. It is these two aspects that distinguish the homo-sapien from other creatures and animals. The conceiving brain and aspiring soul have elevated man to higher levels in search of the spirit, God the Creator. Through spiritual investigations in the realm of the metaphysical environment man evolved religions. Hinduism, the most ancient of all faiths is not one faith but the synthesis of many faiths for the same goal, born on the soil of India. Buddhism is an off-shoot of Hinudism where the emphasis is on self-discipline and self-denial, sacrifice and renunciation to realise perfection. On the other hand moksha is the final goal of the Hindus. Christianity pins its faith on God, realising God through Christ, through hope, faith, charity, and through loving man, the neighbour, which is of paramount importance. Islam carries the essence of all religions and emphasises supreme faith and surrender to God and service to man.

There are innumerable interpretations of religions and methods for practising them. The Hindu is expected to live in his religion all through the day, allowing his body, mind and soul to remain poised on the path—the four-fold path as propounded in the Bhagavad Geetha. The Buddhist is expected to practise the eight-fold principles.

Jesus Christ came into the world to re deem the sinners. Prophet Mohamed came to show the world the path to God. All the great religions recognize the immanence of God and the desire of man to realize Him.

The four great religions find geographical distribution in four different environments. Islam is a religion of the desert, where life is a struggle. Brotherhood of man, loving one another and

being charitable are supreme in the desert environment. Christ came to redeem the sinners. 'Go unto all the world and preach the Gospel' can be better evaluated in terms of the religious quarrels of His time. His crucifixion—for Christ was not honoured in his own country by His own kind. The Jews did not accept his word explaining the evangelical work and of propagating the Gospel. Buddha born in affluence and comfort revolted against wealth and security and sought privation, hunger and sacrifice for self-realization. Christ's message was accepted by peoples of Asia and Africa. Through Europe it spread to America and Australia.

Hinduism caters to every mind. It is individualistic and to that extent democratic in approach which explains the Hindu Pantheon of Gods. What matters most in Hinduism is seeking faith and God through some chosen path and chosen God—a personal God that develops personal attachment with love.

The rhythm of faith in God is like swell on the high seas rising according to environmental stimuli. It soars high with the birth and work of saints, seers and prophets. It ebbs with adverse aesthetic influences which again can be explained as the influence of environment—geographical or otherwise. With political upheavals, economic depressions and social challenges world leaders emerge to transform man and society. The present day world can be said to be going through this phase.

The religious firmament is full of potential as is evident with the youth movements. The older generations the world over are generally strong in their faith. The so-called 'Hippies' perhaps are new factors in modern world in search of reformation, the nature of which time will reveal.

By and large the human soul is pregnant with fervour and hope to toll the bell to announce that God is at hand and Man has to seek. In a world saturated with isms, tensions, illusions and dogmas, man needs a practical religion, free from conflicts and constraints that help him to relax. Man needs a faith that is soothing to his nerves and does not interfere with his normal pursuits and aims. It helps him to live in confidence with himself.

The answer to this is the practice of yoga which is developing a healthy outlook in life to live in peace and be free from fear.

The thinking humanity is attracted by yoga; though of Indian origin, yoga now has universal appeal. There are thousands of institutions that are advocating yoga. People accept according to their own liking and convenience.

CHAPTER I

MAN AS A RESOURCE

The origin of man is traced back to a million years. His development to this present level is because of his superior intellect, skills, attitude and spirit which make man unique on the planet earth. And perhaps no other planet does have the advantage arising out of the presence of human kind.

The natural and cultural landscape of the earth form the world of reality. The content of this landscape of reality represents, in the first instance the terrestrial base and secondly, but the most important, the ideological concept of man arising out of his unique intellect and skills.

Therefore, of the many resources the earth is endowed with, human beings constitute the most important of all. The physical resources were in existence even before the evolution of man on the earth. But they have to wait for their utilisation and development for man to come on to the scene. Man has developed over the many centuries of his existence, technological and scientific skill and expertise which in themselves comprise a resource. By application of the technological resource mankind have been able to identify, excavate and extract the variety of resources of earth and utilise them to fulfil his own needs and desires. And therefore with every step mankind has taken forward there have been continuous changes in economic, cultural and technological spheres. This has created pronounced areal differences in the distribution of resources. Hence, the very word 'resource' also has been undergoing changes. It came to mean different things at different times. They not only include physical endowments like minerals, coal, water, etc. but also encompass the attributes and qualities of human beings as a distinct type of resource. As for instance, location of Punjab and Assam, the climate of Kashmir or Karnataka did not become a resource until the technical qualities of the people, and changes in spatial relations of these places with others made their use possible.

The increased need of non-human resources increased population, thus creating new human resources. How to manage population which forms the base of the human resources, not to be detrimental to the further advancement of human beings is the problem which arises out of the accelerated growth of population, often characterised as 'population explosion'.

POPULATION GROWTH

Population

Growth: An over view

The present is described as the 'period of peopling' of the earth. A casual survey of the history of world population growth will more clearly prove this fact (Table I and Fig 1.1).

TABLE I

World Population Growth—350—1800 A.D.
(in Millions)

Continents	350	600	800	1000	1500	1650	1700	1800
Africa ...	30	37	43	50	85	100	100	100
Asia ...	190	173	180	177	231	311	420	590
America ...	5	7	10	13	41	15	15	15
Europe ...	28	19	29	39	69	90	106	173
Oceania ...	1	1	1	1	2	2	2	2

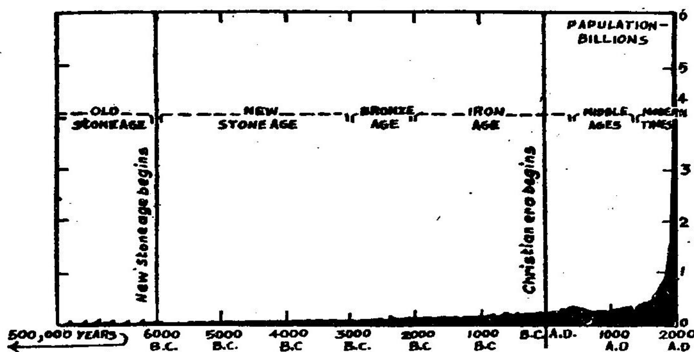


FIG. 1. Population Growth

Man must have been living on this earth since the last 600,000 years at least. During this long period only 77,000 million people are estimated to have lived on the earth. But today 4000 million people are living in the world. The world population before the advent of industrial revolution (1650 A.D.) is estimated at 500 millions. Till this time the rate of growth was 1% in 500 years. But today population increases at an average rate of 2% per annum. Besides some of the countries are growing at 3% and 4% every year (Table II and Table III).

TABLE II

Rate of Growth of World Population

Period		Rate of Growth (in percentage)
1750–1800	...	0.04
1800–1850	...	0.05
1850–1900	...	0.06
1900–1950	...	0.90
1900–1910	...	1.00
1910–1920	...	0.04
1920–1930	...	1.10
1930–1940	...	1.10
1940–1950	...	0.90
1950–1960	...	1.80

TABLE III

Rate of Growth of Selected Countries and Continents

1965—1975

Continents/Countries		Rate of Increase in %
Africa	...	2.7
Latin America	...	2.7
Asia	...	2.1
Europe	...	0.6
Australia & New Zealand	...	1.9
U.S.S.R.	...	1.0
North America	...	1.0

Continents/Countries		Rate of Increase in %
Japan	...	1.2
China	...	1.7
India	...	2.1
Algeria	...	3.3
Liberia	...	2.9
Niger	...	2.7
Canada	...	0.8
El Salvador	...	3.2
Argentina	...	1.4
Columbia	...	3.2
Cambodia	...	2.8
Iran	...	3.0
Albania	...	2.5
Arabia	...	0.4
Spain	...	0.4
Italy	...	0.6
United Kingdom	...	0.14

World Population Growth upto 1650

The population of the world before the advent of agriculture in 8000 B.C. was only 5-10 millions. At the beginning of the Christian era this increased to 250 millions. This population doubled to 500 millions in 1650 A.D.—over a period of 16 centuries.

Till 1650 A.D. the trend of world population growth have not been steady. Growth has been alternating with stagnation and decline (Refer to Table I). It has not been sustained steady growth before 1650 A.D. The subsistence level of agriculture and the unchecked scourges of pestilence, famine and war took away or looted many lives besides the prevalence of a higher rate of infant mortality. Therefore the world population is estimated to have registered a growth rate of 0.01% to 0.02% during this long period.

As for instance the population of Europe declined (refer to Table I) from 32 millions in A.D. 1 to 19 millions in 800 A.D. Asia's population declined from 190 million to 180 millions during this period. Besides there had been very little difference in the rate

of increase between continents and countries also. In fact human population was growing at an extremely slow phase that, between 8000 B.C. and 1650 A.D. it was doubling only once in every 2000 years approximately.

Growth after 1650 A.D.

Unlike before, the world population started growing at a rapid phase after 1650 A.D. (Table 4). The 1650 population of 500 million,

TABLE IV

World Population Growth 1650—1960

Year		Population (in millions)
1650	...	500
1750	...	728
1800	...	906
1850	...	1171
1900	...	1608
1910	...	1786
1920	...	1862
1930	...	2069
1940	...	2292
1950	...	2516
1960	...	2998

doubled in less than 200 years to 1000 millions in 1830 A.D. It again doubled to 2000 millions in 1930 A.D. in just 100 years. Once again, this population has taken just 45 years to double from 2000 millions in 1930 to 4000 millions in 1975. The world population has been cutting the doubling time to less than one half everytime it has doubled. Especially after 1650 A.D. the population increase was steady. The rate of increase was 0.34% per annum between 1650—1950; 0.65% between 1900—1920; and 1.83 between 1950—1960. Presently it is increasing at an average rate of 2% per year.

This steady increase in world population is due to development of productive forces. The resultant economic development had its impact in increasing the populations of the European countries,

from where industrialisation started spreading to begin with. Later it spread out to other parts of the world. Hence world industrialisation and commercialisation have been closely followed by a great increase in population first in the European continent and later in other parts of the world.

Growth by Regions

The pattern of world population growth varies extremely between continents and world regions. The most significant growth of population occurred in Asia. Asians constitute the majority of mankind for a long time now and will continue to do so. The proportion of Asians (excluding the USSR) was 53.3% in 1920 and 56.8% in 1975 (Table V). Its annual rate of growth also increased from 1.5% in 1920-30 to 2.0% in 1970-75 (Table VI). The numerical significance of Europe is no less important; it had 18.2% of world's population in 1920 and 12% in 1975. Even though its proportion is reduced during this period it is far greater than any other continent except Asia. Asia, Latin America and Africa are the continents which go on increasing their proportion while Europe, N. America, the USSR, though contain a significant proportion, show a decline in their share. The rates at which their populations increase (average annual) are also coming down steadily (refer to Table VI).

Trend in Growth and Development of Society

The nature of population growth has a close relationship with the level of development of a society. In ancient and medieval societies the birth rates were very high, but the death rates were equally high due to frequent outbreaks of epidemics, poor sanitary conditions, famines and wars. The result was a very low rate of natural increase. Therefore, very small marginal additions were only made to world population total. The advent of commercialisation and industrialisation stimulated a rapid development of productive forces leading to progress in medicine in Europe. This had the natural impact of drastically reducing the mortality rate. This trend found its way into North America and Australia. At the sametime the Latin American countries were on somewhat a higher level of socio-economic development than the Asian and African countries. Their mortality rates also fell so rapidly that

TABLE V

Proportion of Major Regions in World Population
(in percentage)

Year	USSR	Europe	Asia	Africa	North America	South America	Australia & New Zealand
1920 ...	8.7	18.2	53.3	7.8	6.5	5.0	0.5
1930 ...	8.6	17.2	54.1	7.9	6.8	5.2	0.5
1940 ...	8.5	16.5	54.2	8.3	6.4	5.6	0.5
1950 ...	7.2	15.8	54.6	8.7	6.7	6.5	0.5
1960 ...	7.2	14.2	55.2	9.1	6.7	7.1	0.5
1970 ...	6.7	12.8	56.3	9.6	6.3	7.8	0.5
1975 ...	6.4	12.0	56.8	10.2	6.0	8.1	0.5

TABLE VI

Average Annual Population increase by Regions (1920—1975)
(in percentage)

Year	USSR	Europe	Asia	Africa	N. America	L. America	Australia & N.Z.	World
1920–30 ...	1.2	0.8	1.5	1.5	1.4	1.6	1.1	1.4
1930–40 ...	0.9	0.7	1.1	1.5	0.8	1.8	1.0	1.0
1940–50 ...	0.8	0.3	0.9	1.3	1.3	2.4	1.7	0.8
1950–60 ...	1.7	0.8	2.0	2.2	1.8	2.8	2.1	1.9
1960–70 ...	1.3	0.8	2.2	2.5	1.4	2.9	1.7	2.0
1970–75 ...	0.9	0.5	2.0	3.0	0.8	2.5	1.9	1.8

the natural increase outstripped that of Europe, West America and Australia. Higher rates of mortality were not affected in Asia and Africa and therefore, their rates of natural increase were low But today these countries show extraordinarily unique rates of increase due to sharp fall of death rates and (Table VII) prevailing high birth rates. The fall of death rates is a consequence of benefits of modern medicine to a larger cross section of population. Slowly progressing economic development coupled with higher birth rates and the consequential higher rates of natural increase have all in combination been retarding the economic development of these developing nations.

TABLE VII

Birth Rates, Death rates and Natural Increase of Population of selected Afro-Asian countries—1975

Countries		Birth Rates	Death Rates	Natural Increase
Algeria	...	49	15	34
Angola	...	47	25	22
Central African Rep.	...	43	23	20
Congo	...	45	21	24
Equatorial Guinea	...	49	26	23
Ghana	...	49	22	27
Liberia	...	50	21	29
Malawi	...	51	27	24
Mali	...	50	26	24
Niger	...	52	26	26
Afghanistan	...	49	24	25
Bangladesh	...	50	28	22
Burma	...	40	16	24
Cambodia	...	47	19	32
China	...	27	10	17
India	...	35	16	19
Iran	...	45	17	22
Kuwait	...	47	5	42
Malaysia	...	37	6	31

The net result of such a trend in population growth is that the gap between the developed (industrialised) countries on the one hand and the developing countries on the other is widening. And therefore a slowing down of rate of population growth is of urgent necessity in order to hasten the phase of economic development and raise the standard of living of the developing world.

Future Trends in World Population

The developed and developing countries have distinct differences in the rates of growth of population. The developed nations are increasing at a rate well below 2% per annum Fig. 1.2 whereas the developing nations have rates well above 2% per annum (refer to Table III).

The developing countries are not expected to have major changes in their birth rates till 2000 A.D. Yet their death rates will continue the present trend of steady decline. Therefore they will have higher rates of growth. The United Nations have estimated the world population to grow by 104 percent by 2000 A.D. and reach 6000 million. The developing nations will grow by 112% while the developed by 70%. North America, USSR, and Latin America will have higher rates of increase ranging from 64%—94% among the developed regions, while Europe and Japan will have much lower growth rates. Except for East Asia (66%) no other regions of developing world will have growth rates of less than 150%. Latin America alone is expected to grow by 222% (Table VIII).

Food for the Millions

The last three centuries have been witnessing a sustained growth in world population. The growth was extremely rapid and spectacular since the turn of 20th century, especially the last three decades beginning from 1950. The foremost concern of this proliferation of mankind essentially is one of feeding this teeming millions. As we have already seen, a greater proportion of growth of population has taken place in the developing countries of Asia, Africa and Latin America. Especially the countries in Asia have been supporting for too many people for many centuries now.

Land is almost the sole producer of food. Fig. 1.3 & 1.4 show clearly how population depends on agricultural land for

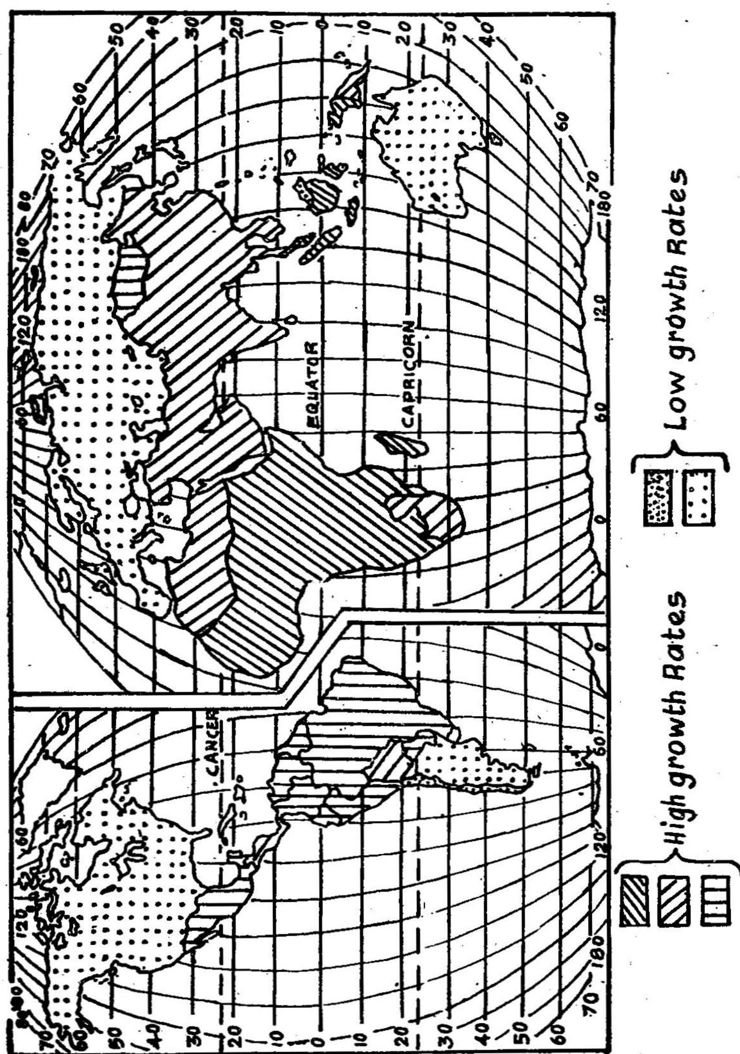


FIG. 1.2 Types of Population Growth

TABLE VIII

The Future Growth of World Population 1960—2000 A.D.

Regions	Population 1960 (in Millions)	Population 2000 A.D. (in Millions)	Percentage Increase over 1960 Population
Developed Region	**977**	**1441**	**70**
Europe ...	425	528	24
USSR ...	214	352	64
North America ...	199	354	77
Japan ...	93	122	31
Temperate South America	33	60	81
Australia and New Zealand	12.7	24.7	94
Developing Region	**2021**	**4288**	**112**
South Asia ...	863	2170	150
East Asia ...	701	1165	66
Latin America ...	179	577	222
Africa ...	273	768	180
Melanesia ...	3	7.8	163

support and sustenance. Distribution of population and the distribution of arable land display a close relationship. As at present around 12% of the earth's surface is arable. This favoured portions of the earth's surface is occupied by man. He is multiplying within its bounds traditionally. The four regions (1) Europe and USSR, (2) the United States and Canada, (3) India, Pakistan and Sri Lanka and (4) China, Korea and Japan alone account for nearly 2/3 of the presently cultivated land.

One fourth or 8000 million acres out of the 32,000 million acres of the surface of the earth is supposed to be potentially arable, or suitable for crop cultivation. Another 1/4 or 8000 million acres can be used for only grazing. It can produce very little food. The rest of 50% of the land surface include waste lands, tundra, desert and mountains and forested lands. Hence this cannot be utilized.

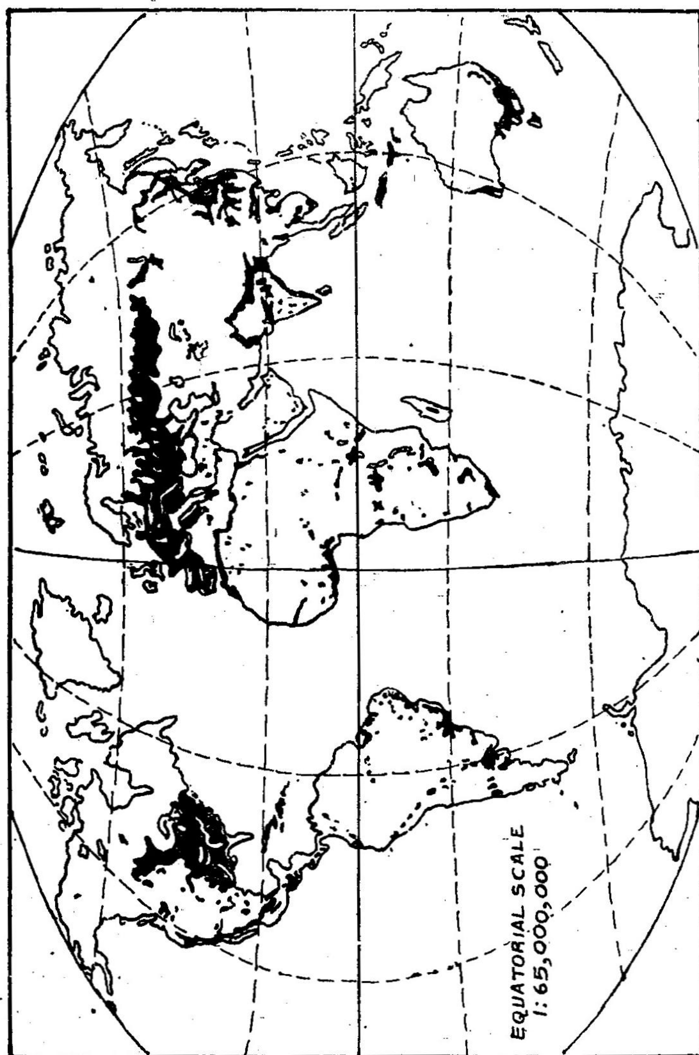


FIG. 1.3 Distribution of Arable Land

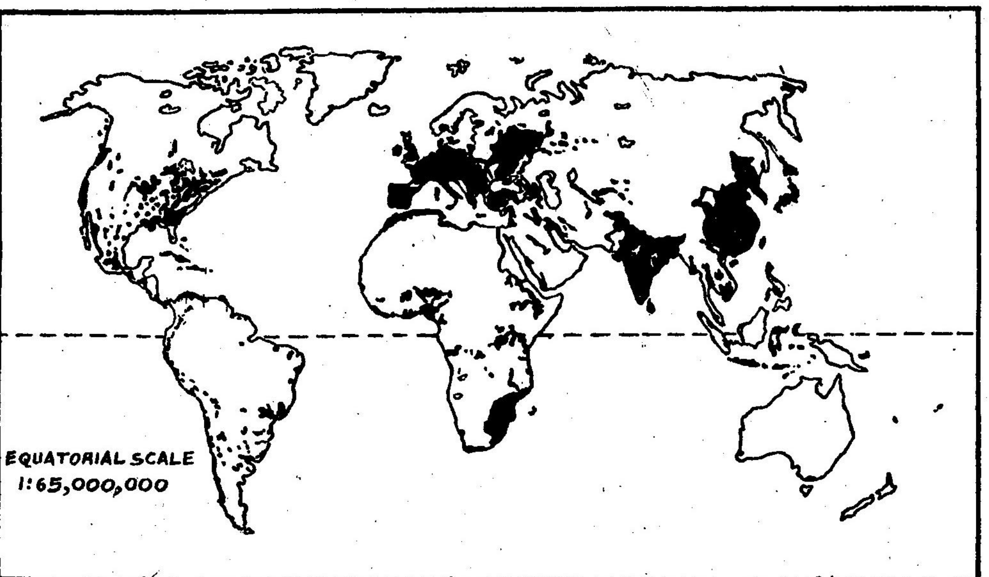


FIG. 1.4 Distribution of Population: Areas with a Population Density of 20 Per. Square Kilometre or More

Presently just 50% of the 8000 million acres of potentially arable land is utilised for cultivation. Only in Asia, Europe and North America arable land is found to occur continuously. Elsewhere in Africa and South America it occurs in scattered patches. These arable tracts are supporting heavier densities of population which are almost sustained in marginal subsistence in the developing countries. Therefore the geographical distribution of hunger and malnutrition almost closely overlap the distribution of countries of the developing world (Fig. 1.3 and 1.4).

TABLE IX

International Differences in Cereal Output per Man

Regions	Agricultural Population 1960	Output of Cereals 1960	Output of Cereals (per capita in metric tons)
Developed Countries ...	**104.2**	**337.2**	**3.2**
North-Western Europe ...	62.9	113.6	1.8
North America and Australia ...	17.5	202.6	11.5
Japan ...	23.7	21.0	0.8
Developing Countries ...	**1468**	**642.4**	**0.4**

Areas of Surplus and Deficit in Food

A close look at the Tables VIII, IX, X and XI clearly delimit the areas of surplus and deficit in food production and consumption as well. The developed countries, namely, the United States, Canada, the USSR, Argentina, Australia, Newzealand and some of the European countries have surplus food grains. Other countries depend on import of food grains. Countries belonging to the developed group do not have difficulty in importing as they are industrialised. But the developing countries have chronic deficit in food grains (Fig. 1.5).

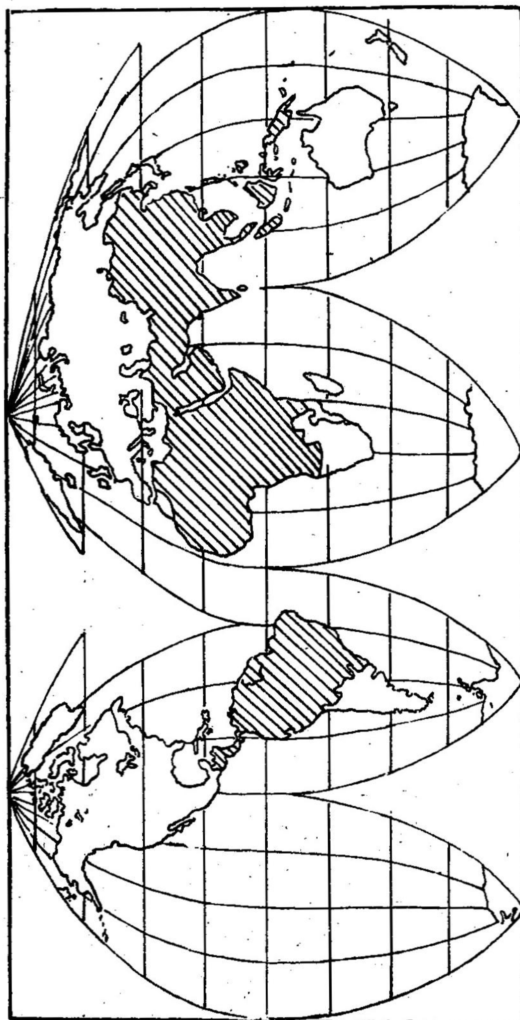


FIG. 1.5 Food Deficit Areas

TABLE X

Percentage of Cultivated Land and Per capita Cultivated Land

Continents/Countries		Percentage Area Cultivated	Area Cultivated per capita
Asia	...	83	0.7
Africa	...	22	1.3
Australia	...	2	2.9
North America	...	51	2.3
The USSR	...	64	2.4
Europe	...	88	0.9
South America	...	11	1.0

TABLE XI

Consumption of Food in Grams/Head

Continents/Countries		Per capita Consumption (in grams)
South Africa	...	45
Canada	...	46
USA	...	42
Argentina	...	43
Australia	...	58
USSR	...	45
The World	...	20
Egypt	...	19
China	...	5.1
India	...	6.2
Indonesia	...	8.4
Pakistan	...	9.8

The per capita consumption of food (Table XI) reveals that the developing countries fall far too short of the world average of 20 grams per day per head. In terms of caloric intake also (Table XII), the developing world are very much below the minimum required caloric value per day.

TABLE XII

Per Capita Daily Supplies of Calories

Region		Calories Requirement	Calorie Supply
Far East	...	2300	2050
Near East	...	2400	2450
Africa	...	2400	2350
Latin America	...	2400	2450
Europe	...	2600	3000
North America	...	2600	3100
Oceania	...	2600	3250
World	...	2400	2400

The foregoing account makes it clear that 2/3 of the world's population living in the developing worlds suffer from want of food.

Increasing Food Production

There is a greater need and necessity to improve and increase food production to adequately feed the ever proliferating human population. The means of achieving this end is limited and calls for utmost human ingenuity and application of scientific and technological knowledge.

Production of food can be increased

by bringing under cultivation the 50% (4000 million acres) of potentially arable land surface of the earth, which is not presently cultivated,

by enhancing the productivity of land presently used for food production,

by preventing loss of valuable food grains by rats, fungi and insects,

by introduction of innovative methods of cultivation, introduction of new strains of food crops etc.,

by changing the economic base of the people by providing greater returns to the food producer which would induce him to produce more,

by a judicious application of knowledge in nutrition, limited supply of food would be used better.

CHAPTER II

POPULATION DISTRIBUTION AND DENSITY

I. DISTRIBUTION OF POPULATION

The outstanding feature of present day population distribution is its unevenness. It has always been the geographers' task to give suitable answers for the following questions associating with the unevenness. How did this unevenness emerge in the population distribution? What are the basic factors associated with the overall distribution of population in the surface of the earth? The usual reply carries only two major factors namely physical and climatic limitations. Such simple explanations may not be sufficient because, the vast empty lands are as significant as the settled, for most men have shunned vast areas because of their unfavourable climate and terrain. Therefore, an elaborate study is necessary as regards the overall distribution of population and the various factors associated with it.

It is obvious that the land area is only one fourth of the total area of the earth surface which is also distributed unevenly on the globe. It is quite natural, therefore, variations in the type of land from one place to the other significantly influence the population distribution. There are about two third of the world population distributed over one seventh of the land area. In fact, the entire world population is distributed only in 55 million square km. area out of the total area of 135 million sq. kms. (see Fig. 2.1). It is also interesting to note that about 50% of the world population is distributed in 5% of the land area while 57% of the land area contain even less than 5% of the population. In addition, population is not uniformly distributed even in the above areas. Finally, all these variations found in the land area as regards the unevenness of the population distribution will facilitate to understand the various associated factors.

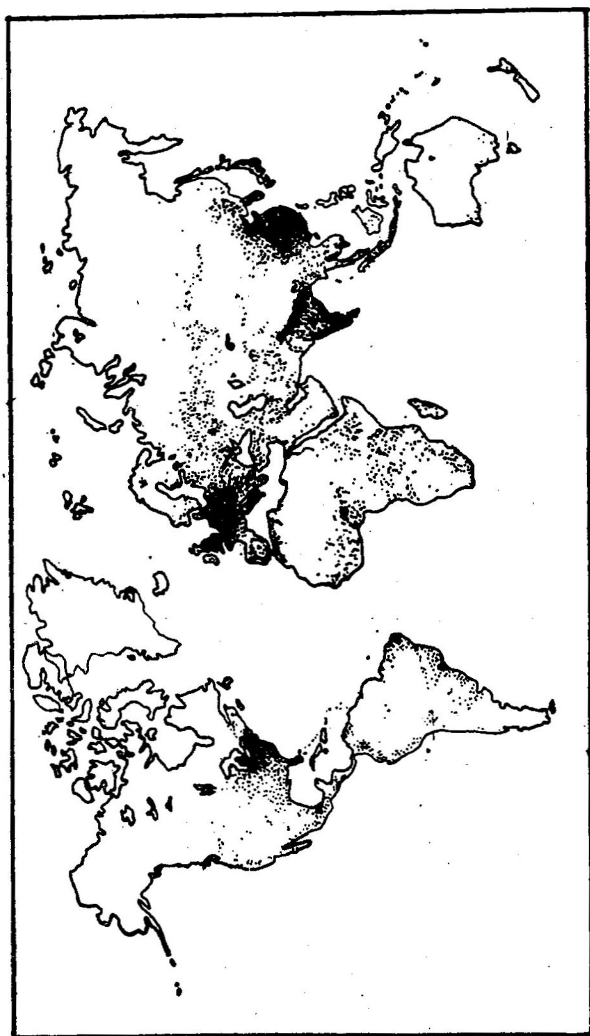


FIG. 2.1 Distribution of Population

On the basis of the unevenness found in the distribution of population over the earth surface the entire land area of the globe can be divided into two types namely:

(*a*) ' Ecumene' areas

(*b*) 'Non-Ecumene' areas.

The term 'Ecumene' applies to the inhabited parts. On the contrary the term 'Non-Ecumene' denotes the unoccupied and temporarily or very sparsely occupied portions of the land surface.

'Ecumene' is not a closed compact area and so one cannot locate the exact area over the globe. However, the boundary between 'Ecumene' and 'Non-Ecumene' areas keeps changing with improvement in Science and Technology. The delimitation of the boundary can be done on the basis of various elements. The major elements normally considered are climate, terrain etc. for this kind of delineation. The worst climatic conditions are closely associated with unsuitable living conditions of the people. Therefore, it is possible to locate the Non-Ecumene areas much easier. With the result, one can easily identify the boundary between Ecumene and Non-Ecumene if he answers the following questions before us: How to locate Non-Ecumene areas? What are the characteristic features associated with them? and What are the areas they include in the entire earth surface?

Non-Ecumene areas

Unoccupied or only periodically occupied lands are mainly those which present serious physical obstacles to settlements. The obstacles as already cited are primarily climatic in character. The too cold and too dry areas of humid tropics comprise most of the Non-Ecumene regions of the world. The Non-Ecumene regions therefore include areas of the ice cap, hot deserts, and the hot wet dense forest areas of the tropics.

(1) *The Ice Cap*: Around the arctic sea there is a great peripheral waste which includes Greenland, much of Northern Canada, Alaska and Siberia, a region of snow and ice and tundra. They are fringed by dense taiga forest land. Under certain special conditions man like Eskimo can get to live with such an environment. But they are sparsely distributed. Hence, though much of this land seems empty, it is not uninhabited.

(2) *The Hot Deserts:* Another group of inhospitable regions consists of the hot and temperate deserts and scrub lands. Here moisture is lacking. North of the equator, this belt is dominated by Sahara and Saudi Arabia. In addition, it includes certain difficult parts of Inner Mangolia (Gobi), Tibet, the Aral basin, and the arid regions of the South West of the United States. South of the equator, the Kalahari, vast areas of West and Central Australia and the Atacama desert are relatively uninhabited.

(3) *The Hot Wet and Dense Forest Covers:* This region includes the zone of tropical rain forest covers. It has proved very difficult to man where nature chokes with an abundance of life. Amazon and parts of South East Asia are notable examples.

Lastly, there are empty areas scattered over the distribution map (see World Map Fig. 2.1) which reveals man's difficulties in mountain tops. In fact, the physiological obstacles to living at greater heights are considerable and only very few areas over 3000 mts. are habited.

Ecumene Areas

Inhabited areas which can be differentiated from the unoccupied or Non-ecumene areas are gradually increasing and are filling with population due to various factors. The major factors among them are as follows:

(1) Increase in the man's ability to regulate water by irrigation and the extension of drainage facility.

(2) Discovery and utilization of minerals.

(3) Technological developments in various fields.

(4) The diffusion of old world garden crops like Sugarcane, Paddy, Coffee and new world crops like Maize, Tobacco and upland cropping pattern.

At the outset, it should be noted that the ecumene is more in the northern hemisphere where the land area is more. It is also pertinent to note that the population is unevenly distributed even in ecumene areas due to the varying nature of the already cited factors. In certain Ecumene areas people are highly concentrated whereas the concentration is considerably less in certain other Ecumene

areas. Therefore, one can classify Ecumene areas on the basis of the degree of concentration of population.

In general Ecumene areas are classified as follows:

(*a*) Major concentrations,

(*b*) Minor concentrations.

Major Concentrations

There are four major concentrations, namely, (i) South Asia, (ii) East Asia, (iii) West Europe and (iv) Central-East America. It is notable that all of them are located in Northern hemisphere which is otherwise called people hemisphere. Further, all these concentrations accommodate about 80% of the total world population (see Fig. 2.1 and also Table I). In fact, Asia alone

TABLE I

World Population: Continentwise during 1971, 1975 *and* 2000 (*Estimated*)

World-Continents		1971 Population in millions	1975 Population in millions	2000 Estd. Population in millions
World Total	...	3647	3967	7522
Asia	...	2073	2256	4513
Europe and U.S.S.R.	...	702	710	973
Africa	...	350	401	860
North America	...	186	237	388
Latin America	...	315	324	755
Oceania	...	19	21	32

Source: Compiled from various records, 1978.

constitutes 60% of the total world population in its two different zones of concentrations, namely, (1) South Asia and (2) East Asia. Whereas Europe and North American concentrations constitute the rest of the 20% population. It is interesting to note that the South Asian concentration faces the Indian ocean and the East

Asian concentration faces the Pacific and these two have essentially a Tropical and Sub Tropical location. The remaining two clusters that is local or European and central East American clusters face Atlantic ocean on either sides.

(i) *South Asian Concentration:* The abundance of moisture and the richness of life in monsoon lands is the background of the very high concentration of people. Here, climatic conditions often allow double cropping. People mainly rely upon agriculture. Large areas of coastal plains with alluvial soil, monsoon climate and tradition build on agriculture favour successful intensive agricultural system. In short, this concentration reflects the subsistence agriculture.

South Asian concentration includes four sub clusters, namely, India, Pakistan, Bangladesh and Sri Lanka of which India is the largest cluster. It constitutes about 597 million people. Here, majority of the population (i.e. about 80%) live in rural areas particularly in the Ganges plain and east-west peninsular coastal plains. The second cluster, namely, Pakistan, has about 60 million population. Most of the Pakistan population is distributed in the Indus River Valley and its tributaries. The third cluster, namely, Bangladesh constitutes about 70 million population. Its population is almost equally distributed over the vast agricultural land area. Finally, the fourth one namely, Sri Lanka cluster constitutes about 15 million population particularly around its coastal plains.

(ii) *East and South East Asia Concentration:* It includes clusters of China, Japan, Korea, Malaysia, Vietnam, Burma, Thailand and Indonesia etc. As already cited in the case of South Asian concentrations most of these clusters are also reflecting the subsistence agricultural economic activities. In fact excluding Japan in all the other clusters agriculture as a primary occupation dominates the activities of their people. Japan which was originally a country with majority of the population working in the fields has in recent times shown a change over from agriculture to non-agriculture activities.

Being the world's largest country as regards its population and size China provides means for living for about 850 million population. In fact, it accounts about 15% of the world's total. Here

most of the people live in rural area. The population is highly concentrated in central provinces and in the extensive coastal areas.

As against China, Japan has no favourable conditions for agricultural development but its industrial development is highly notable. About 110 million population is concentrated over its four major islands mainly due to the above cited factor.

In this concentration among other notable clusters Indonesia has 128 million population. Here population is highly concentrated in Java, Borneo and Sumatra islands. Further it is notable that in the case of Thailand and Korea about 41 million and 34 million people are concentrated in them respectively.

(iii) *West European Concentration:* Europe which comprises about 4% of the world's land area (excluding U.S.S.R.) has 472 million population that is 12% of the total world population. Here the population is more uniformly distributed than elsewhere in the world. It is mainly due to the following favourable conditions prevailing over here:

(1) Extensive low land with suitable aluvial soil is available for agriculture.

(2) The temperate climatic condition is more favourable to raise various crops.

(3) High degree of industrialization and technological development.

(4) Availability of abundant natural resources.

(5) Efficient means of transport facilities.

(6) The development of trade and commerce etc.

This concentration includes the clusters of the following important countries, namely, West Germany, United Kingdom, Italy, France, Netherland, Belgium etc. Among all these clusters West Germany tops the list as regards the population size with its 62 million people. Here the population is highly concentrated in coal fields. The second larger cluster, namely, U.K. constitutes about 56 million population. Most of its population concentrated in the industrial districts in the greater London and its surrounding region. In addition there are about 55 million people distributed in Italy. Here, the north Italian plain and most of the

Mediterranean coastal land of Italy show high concentration of population. Whereas in the case of Belgium which constitutes about 10 million population, people are concentrated in coastal plains. In general it is interesting to note that all these clusters reflect the intensive industrial activities.

(iv) *East and Central American Concentration:* When compared to other concentrations it is considerably a smaller one. It has about 200 million population. It is pertinent to note that the people of this region are almost derived from European stock. The temperate climatic condition prevailing over this region favours extensive agricultural practices. Here the newly settled Europeans, who were already developed technically in their motherland made use of available large amount of coal, petrol and iron ore. Hence industrial development becomes the major factor for this concentration. In fact it reflects the technical advancement of the industrial revolution. Further there are about 80% of the total population of United States of America which constitutes about 7% of the world total population found in this area of concentration. In addition it is pertinent to note that this high concentration of population is also associated with the growth of a number of large cities and metropolis than elsewhere in the world. In fact it exactly coincides with the North-eastern part of United States which includes north of Ohio and Potomac Rivers and east of the Mississippi. Here the great urban industrial 'conurbations' are numerous. It includes such giants as Newyork and Philadelphia metropolitan areas which constitute highly urbanized population of the world.

Minor Concentrations

At the outset one can visualize from the distribution map that there are wider areas of Minor Concentrations of population found in the following five major land surface of the earth. They are namely: (i) U.S.S.R., (ii) Africa, (iii) North America, (iv) South America, (v) Australia and New Zealand. Population is sparsely distributed in all these areas. However, within these areas it is notable that there are significant variations among the distribution of population.

(i) *U.S.S.R.:* As an individual nation with its vast land area U.S.S.R. has a population of about 250 million. It ranks third

next to China and India. It has widely distributed resources and sparsely distributed population and is one of the largest industrialized countries of the world followed by U.S.A. and Japan.

(ii) *Africa:* In Africa about 15% of the world population is distributed in 20% of the total world land area. Here, population is sparsely distributed in the following major countries such as Nigeria, Algeria, Ethiopia, Union of South Africa, Southern Rhodesia, Western African countries like Sierra Leone, Senegal, Ivory-coast, Gambia and Ghana. Invariably in all these countries population is distributed in rural areas and also they are mostly depending on agricultural production. Among these countries Nigeria is one of the popular countries. It has about 60 million people. Whereas Egypt another notable country constitutes about 36 million population in its 3 million sq. km. area. In Egypt population is mainly concentrated in the Nile Valley delta.

(iii) *North America:* It includes Canadian land mass and U.S.A. In the entire Canadian land mass population is thinly distributed. However almost 63% of its population is distributed in about 10% of land area lying particularly along its southern margin just 300 kms. away from U.S.A. boundary. Population is mainly depending upon irrigation lands and is unevenly distributed. In the case of United States the notable areas of minor concentration of population are South-east central and Western Coastal margins.

(iv) *South America:* In its 120 million sq. km. area about 300 million population is distributed. Here the following are the areas of minor concentration of population:

(1) Valparaiso which enjoys mediterranean climate suitable for agricultural production.

(2) The temperate grass land areas of Argentina and its surrounding Buenos Aires areas where wheat cultivation and cattle rearing activities are ideally suited.

(3) Coastal lands of Eastern highland where soil and climate favours the growth of coffee etc. and

(4) The coastal parts of Argentina, Peru and Chile where agricultural activities flourish.

(v) *Australia and New Zealand:* The Australian continent which extends over an area of 7.7 million sq. km. only constitutes totally 13 million population. It is one of the sparsely populated countries of the world. In this vast continent its 95% of population are concentrated in temperate zone particularly in the continental margins including Eastern and South-eastern coastal lowlands. Other than mining and industrial activities people are predominantly engaged in sheep and cattle rearing activities. One of the characteristic features of its population is its 'White Australian Policy' which restricts the immigration of the people of Asian and other non-European nations. In the case of New Zealand which lies just north-east of this vast southern continent, has 3 million people in its 269,000 sq. km. Here, population is distributed in its two major islands. After the development of gold mines it has larger white migration. In addition, here, agricultural practices are going on in Northern and Southern plains of the main land.

II. DENSITY OF POPULATION

At the very glance over the map of distribution of population it is clear that there exists significant variations among the different clusters of population. All these internal variations suggest great differences in 'density of population' in various Ecumene and Non-Ecumene areas of the world. The simplest way in expressing the density of population is 'man-land ratio'. In other words, 'Man-land ratio' means that the number of population living in a unit area. For example, Density of population in Singapore accounts 3,600 persons per sq. km. Whereas Australia accounts only 2 persons per sq. km. and world density is 25 persons per sq. km. (see Table II). In its simplest form it is too generalised because, it varies from 2 persons per sq. km. in Oceania to 147 in Southern Europe. Further, it does not take into account the wide variation of the distribution of population found in Ecumene and Non-Ecumene areas of the world. However, the average density of population pertaining to various countries in the world will clearly show all the above cited variations. In general, all these countries can also be grouped into four categries on the basis of Arithmetic density of population such as : (i) very high, (ii) high, (iii) low and (iv) very low density of population.

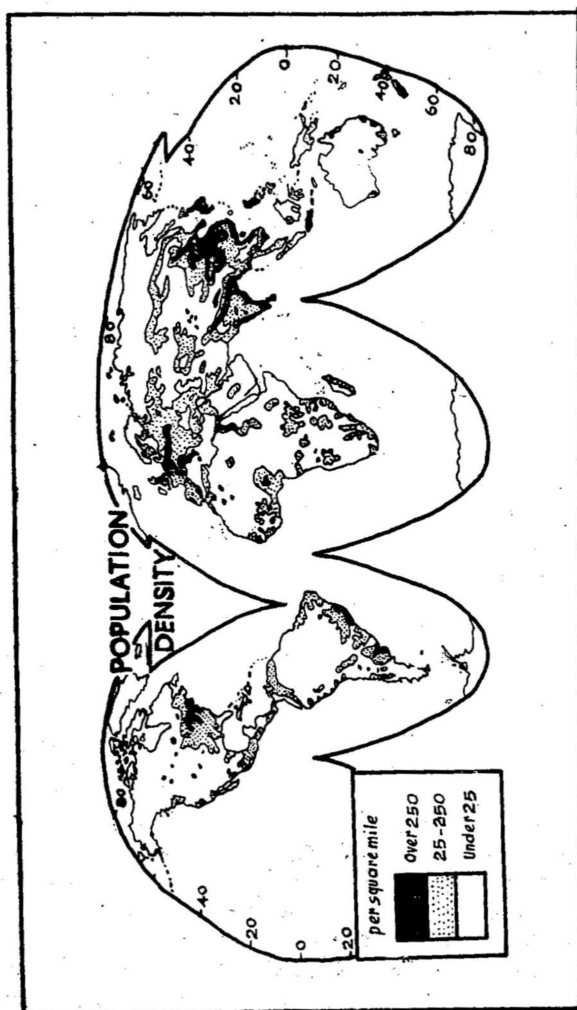


FIG. 2.2

TABLE II

World Density of Population

Area		Population in Millions 1966	Area: Square Kms. in Thousands	Population Density per Square Km.
World	...	3,356	135,697	25
Africa	...	318	30,244	11
North America	...	217	21,515	10
South America	...	253	20,553	12
Asia	...	1,868	27,543	68
Europe	...	449	4,929	91
U.S.S.R.	...	233	22,402	10
Oceania	...	18	8,511	2

Source: U.N. Demographic Year Book, 1967.

(i) *Very High Density of Population:* The countries with more than 150 persons per sq. km. includes in this category. It is pertinent to note that almost all the following countries such as India (176), Sri Lanka (202), Japan (291), Korean Republic (334), West Germany (249), U.K. (229), Italy (182), Belgium (320), Netherlands (329) which are located in Eurasian Continent include in this category. In fact, all these above cited countries lie within the major area of concentration.

(ii) *High Density of Population:* The countries with a population density of 21 to 150 persons per sq. km. are belonging to the high density category. In this group countries like U.S.A. (22), Ethiopia (21), Mexico (28), Nigeria (65), China (85), Indonesia (84), Thailand (77), Pakistan (83), France (95), Cuba (78) etc. are notable. All these countries are notably lying within the Ecumene areas of major concentration. Since the prevalence of considerable extent of Non-Ecumene areas they may not have very high density of population but are possessing high density.

(iii) *Low Density of Population:* If the country's average is 6 to 20 persons per sq. km. it will belong to this low density group.

This group of countries consisting of low population density includes the following, namely, Brazil (12), Argentina (19), Columbia (20), New Zealand (11), U.S.S.R. (11), Sudan (7), Algeria (7), Egypt (12) etc. Here the density becomes low mainly due to the existing high Non-Ecumene areas. But in fact it is notable that all these countries lie within the Ecumene areas of minor concentration.

(iv) *Very Low Density of Population:* The countries such as Australia (2), Canada (2), Antarctica, Saudi Arabia (4), Libya (1) are having very low density of population. Density, here, falls from 5 to 1 persons per sq. km. Except few patches it is pertinent to note that all these areas almost coincide with the Non-Ecumene areas of the world.

In general all the above cited variations in the density of population will naturally cause for certain advantages as well as disadvantages. For instance, if the *density* of population of a country or a region is *low* that country or region will face the following advantages and disadvantages:

The advantages: (1) More land per head will be available; (2) Food problem may not be a major problem; (3) Profitable mechanization of agriculture is possible.

The disadvantages: (1) Labour scarcity; (2) Lesser social contact.

Similarly, if the *density* of a region is *high* it will naturally face the following advantages and disadvantages:

The advantages: (1) Closer contact of people; (2) High man power; (3) High circulation of goods; (4) Exchange of ideas encourage the regional progress.

The disadvantages: (1) The restricted movement; (2) Food problem; (3) Problem of Health and hygiene; (4) Water scarcity and housing problems.

By and large all the above cited advantages and disadvantages associating with the density of population will naturally disturb the distribution of population. The resultant disturbances may arise when in a given region, people do not find better opportunities

to get the livelihood, they tend to move away from one region to another. In short it results in migration.

Migration of Population

Population of a nation or region may gain in size by an influx of migrants and it may diminish in size by an exodus of its members to join another nation's or region's population. This in-migration or out-migration will affect not only the size but also the composition of population like demographic social or economic characteristics etc. Since it is an important component of population growth and change in composition, the study which deals with the movement of population otherwise known as 'migration' becomes inevitable.

By definition, Migration means the movement of people from one region to another region, within the same country or from one country to another country with a view of permanent settlement. If the movement takes place within a nation or region it is called 'Internal migration'. If it happens between the nations or regions it is called 'International or external migration'. Further, on the basis of the origin and destinations of the migrants it can be classified into two types. They are: (1) in-migration or Immigration; (2) out-migration or Emigration.

(1) *Immigration or in-migration:* It means that the people come to a country or a region with a view of settlement;

(2) *Emigration or out-migration:* It means that the people get out of a country or a region for settling somewhere else.

Migration is a response of human organisms to economic, social and demographic forces in the environment. Moreover, the action of human beings is motivated by the desire to satisfy needs or to avoid discomfort or pain. Therefore, migration takes place due to various 'push' and 'pull' factors.

A. Push Factor

(i) Decline in national resources like mine, timber, agricultural resources.

(ii) Loss of employment.

(iii) Oppressive discriminatory treatment due to political, religious aspects.

(iv) Retreatment due to employment or marriage.

(v) Retreatment due to flood, fire, drought, earthquake, epidemics etc.

B. Pull Factor

(i) Opportunity for better employment.

(ii) Opportunity to earn large income.

(iii) Opportunity to obtain specialized education like college-level education etc.

(iv) Preferable environment and living conditions such as climate, housing, schools, and other community facilities etc.

In addition, there are variety of forces, which can operate to suppress migration, acting upon the major fields of migrations. In general, the field of migration study can be conveniently divided into two parts on the basis of the migration fields. They are as follows:

(1) Internal migration, or the migration of persons within a nation.

(2) International migration or the migration of people between nations.

(1) Internal Migration

Internal migrations are taking place in both industrially developed and developing nations.

(a) Internal Migration in Industrialized Nations

In the case of industrially developed nations, there are two major internal migratory movements normally taking place. They are:

(i) A massive exodus of persons from low income rural and economically depressed areas towards the great metropolises where

new employment opportunities and economic growth are concentrated.

(ii) Secondly, people are moving from the core of the metropolitan centre to the periphery.

For example, the first type can be seen in Japan's internal migration during the period between 1955 and 1960. Here, four major metropolitan centres, namely, Tokyo, Osaka, Nagoya and Fuouoka were shown extraordinary growth during that time.

On the contrary the second type can be cited with the help of the event in Federal Republic of Germany in Europe. Here, the lakh cities inhabitants have had a negative net migration. People were out-migrated from these cities towards their suburbs. With the result rural areas outside metropolitan areas were developed and simultaneously decongestion also takes place.

(b) Internal Migration in Developing Countries

In the case of developing countries two different types of migrations are internally happening. They are:

(i) Movement to settle new lands or exploit new resources.

(ii) Movement in response to industrialization.

The first type can be illustrated with the help of movements of peasants to new farming areas occurred in South East Asian countries. For example, in Burma large number of peasants from upper Burma settled in the irrigated deltas of lower Burma. It is due to the fact that at the turn of this century, Burma became an exporter of rice. Similarly, during several decades movement from North to South has taken place in Vietnam. In Ceylon, Indonesia and the Philippines, the governments have rendered systematic assistance to the transfer of rural families from densely settled areas to the lands of better opportunity.

Secondly, in India and Pakistan the urban labour force is sizable and the urban unemployment rates are high. It acts as deterents to fresh flow of migration from rural areas to urban areas. For example, in India the net rural-urban migration during the 1941-1951 decade was 8.2 million while it was only 5.2 million during

1951-61. This comparatively low level of urbanward migration is due to slow pace of industrial and commercial expansion. But in Pakistan, particularly, in Karachi during 1951 population was 1,800,000 out of which natives were 200,000. The balance were refugees from India and in-migrants from rural areas of other districts.

(2) World International Migration

The movement of population between nations is the most dramatic form of migration and it has two types that are cited already as Emigration and Immigration.

An important element in these international flow of migration today is the existence of legal restrictions to movement. Most of the nations regulate the flow of migrants across their borders either by

TABLE III

Number of Immigrants and Emigrants, Selected Nations: 1960

Nation		Number of Immigrants	Number of Emigrants
North America:			
1. U.S.A.	...	272,238	—
2. Canada	...	104,928	—
Asia:			
1. Japan	...	21,175	68,356
2. Hong Kong	...	35,055	—
Europe:			
1. Germany	...	—	259,880
2. U.K.	...	84,740	93,178
Oceania:			
1. Australia	...	39,371	46,595
2. New Zealand	...	21,424	14,848

Source: United Nations Demographic Year Book, 1962.

establishing quotas or by establishing qualifications that potential immigrants must possess or both. The most severe of these restrictions have been imposed by industrialized and wealthy nations for the purpose of avoiding an invasion by citizens from under-privileged nations. Because of these restrictions, international migration since 1960 has been at low ebb.

In spite of all these above restrictions only a few countries—United States, Canada, Brazil, Israel, New Zealand, Australia and Hong Kong are receiving migrants in significantly large numbers for permanent settlements (see Table III).

On the otherhand, the developing nations which have the most severe problems of population pressure and the lowest levels of living—China, India, Pakistan, Indonesia, Philippines and Egypt—all have no significant emigration and immigration.

An important feature among all the above cited international movement of the population in the entire world is Immigration of

TABLE IV

Immigration to the United States (1966)

Country		Total Immigrants
North and Central European Countries	...	57,059
Eastern Europe	...	20,477
Southern Europe	...	45,086
Asia	...	39,878
Latin America	...	124,818
Africa	...	3,137
Canada	...	28,358
Total	...	323,040

Source: Statistical Abstract of the United States, 1967.

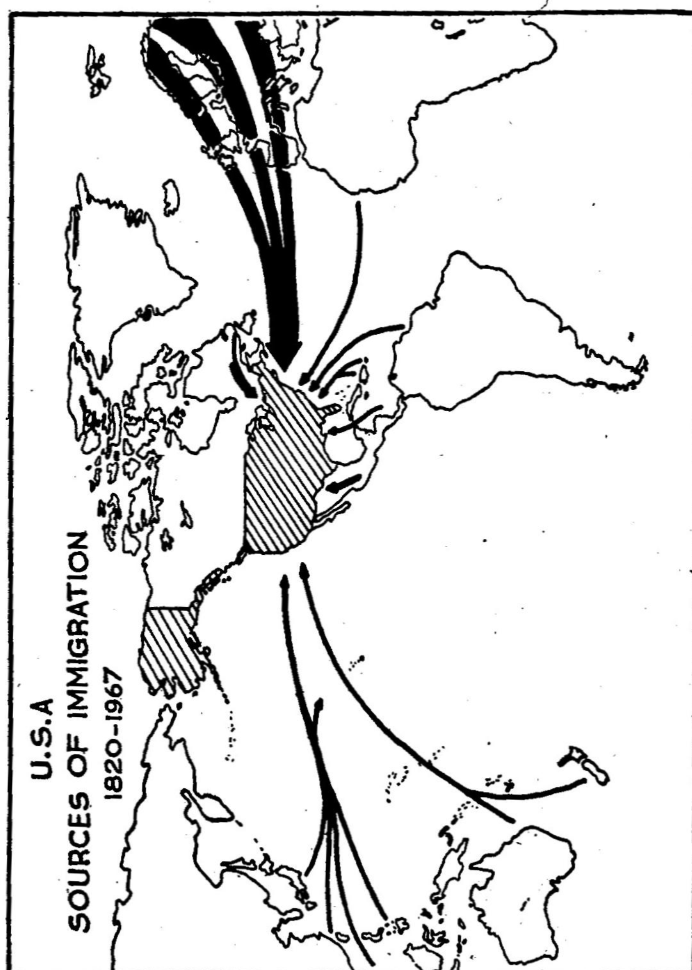


FIG. 2.3

United States of America. Therefore, it is worth to study in elaborate detail in regard to its various characteristics of immigrations and immigrants.

Immigration in the United States of America

The U.S.A. is one of the few nations that are still absorbing immigrants in large number. Every year about 25 lakh immigrants enter U.S.A. No other nation of the world has such a volume of immigration. Where do these migrants come from ? The Table, IV will give clear picture of the number of immigrants in 1966 according to the last country of permanent residence. The leading countries from which migrants are coming are as follows: Mexico, West Indies, Canada, South America, Italy, Great Britain, Germany in Western Europe, China in Asia, Poland, Portugal, Greece, etc. (see Fig. 2.3).

The notable characteristics of immigrants are as follows:

(1) Immigrants are predominantly female.

(2) A very large proportion of adult immigrants aged 16-45 years with few elderly people and few children.

(3) It has more of the characteristics of a 'Brain drain', robbing Europe and many developing countries of their Scientists and talented leaders.

CHAPTER III

AGRICULTURE

Man engages in many different economic activities to gain livelihood in which agriculture is one of the fundamental ones, because it occupies a vast area of the landscape. Majority of his fibre requirements and many industrial raw materials are derived from agricultural sources. Farming actually is a rather recent innovation and its beginnings date back to a mere 12,000 years. The permanent settlement which provides one of the contributions for the development of agriculture is made; it permitted man to settle permanently in one location, giving an assurance of food supply throughout the year. The agricultural revolution which happened between 10,000 and 20,000 years ago was the result of man's independent invention in areas like Middle East, Central and South America and South-east Asia.

Significance of Agriculture

In analysing the agricultural origins and dispersals (1952) Carl. O. Saucer says that South East Asia may have been the place where the first farmers lived. He points out that the conditions of natural vegetation, climate and soils must have been favourable for such development and believes that the knowledge about cultivation gained and spread out into China, India, even Africa. According to the other scholars, the other notable places of agricultural inventions are Middle and South America, Middle East, North Africa and South-west Asia. Another area of significant plant-domestication falls in the African Great Lakes region. The knowledge of crops and cultivation techniques is diffused from the above mentioned locations of invention to different other parts of the world (Fig. 3.1).

The land known as the natural environment is the agriculturist's basic resource. The agriculturists have the choice of using this resource in two fundamental ways, in one he may regard the land as a *fund type resource* to be exploited before moving to other area,

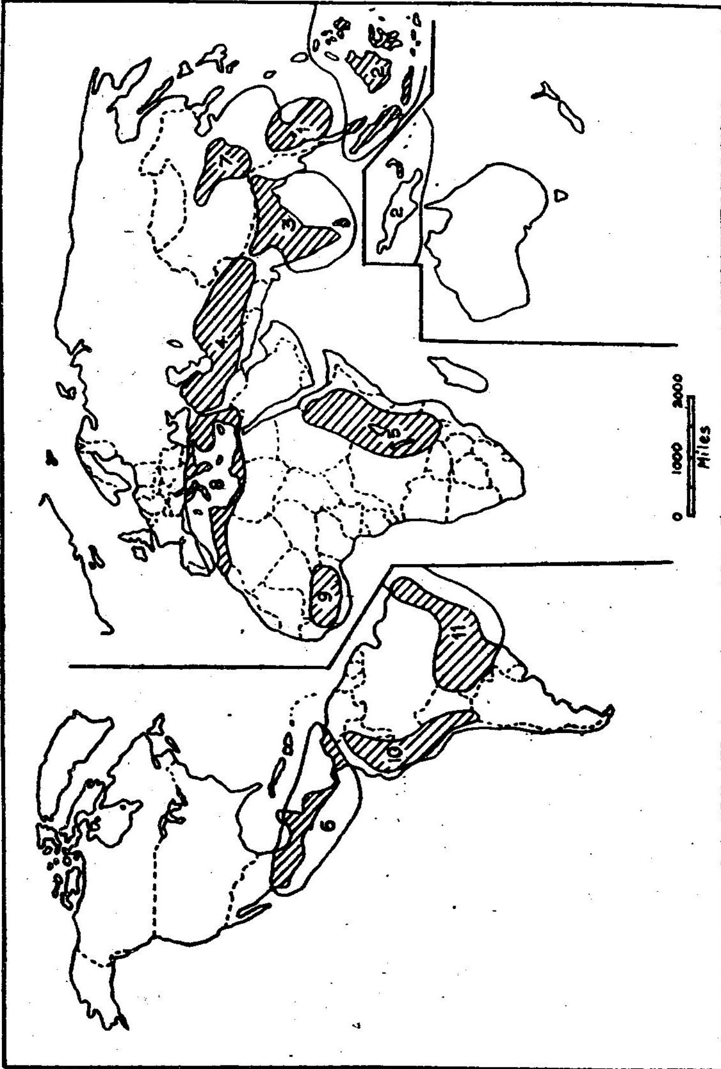


FIG. 3.1 Regions of Significant Plant Domestication

and in the other the same land may be regarded as a *flow type resource* to be utilized in such a way so as to maintain its productivity in an infinite manner. The agriculturist's response is mainly affected by the inherent qualities of the land, the pressure of population of the land, and the degree of technological skill and cultural background of agriculture. The production of goods is mainly based on the application of labour and capital to the land.

Agricultural Activities and the Physical Environment

The spatial variation in the physical environment limits the distribution of plants and animals. The relevant physical limitations of the world's more important domesticated plants is one in which the plant's maximum yield can be most easily obtained. Secondly, the interdependence of all aspects of the environment affects their individual significance. It is also known that the availability of moisture to plants depends not only on its amount and timing but also on the texture, structure and organic matter content of the soil. Thirdly, the susceptibility of a plant or animal to a particular environmental stress depends on its stage of growth. In general, the environmental stress is considered to be more significant in the early stages of a plant's life cycle. The close observation of the different environmental characteristics show the changes with increasing plants maturity. Fourthly, the environment's variability in both time and space is one of its important characteristics.

The biological nature of the production process provides the link between the physical environment and the spatial organization of agricultural activity. The land use pattern of agricultural systems depend not only on the physical environment and plant/animal relation but also on social and economic considerations. Rapid population increase and traditional farming systems to an over-exploitation of resources set the individual farmer beyond his control. The productivity can be measured by means of flow of energy and movement of matter within the agricultural system. In most situation the physical environment reduces the agriculturist's choice either by profiting the growth of certain crops altogether or by reducing their levels of output to an unprofitable degree. Because this may be determined by the factors such as economically

performed enterprises, available technology and the ability of the farmer.

The implementation of new technological development is important to measure the intensity of agricultural development. The economic importance of the technological development is dependent on the overall profitability of the farming industry. It is understood that the most important benefit to agriculture of technological advance has been to increase the range of enterprise choice within a given physical environment and this has been not only by ameliorating its effects but also by improving the husbandry techniques. Attempts are continuously being made to reduce the uncertainty association with weather variability and to extend the growing season by such means as cloud seeding and irrigation. Fertilizers, drainage systems and mulches have reduced soil limitation and most powerful medicines, new breeding improved plant varieties and animal breeds have increased the output. The major problem associated with the management is the technical difficulties in concern with the production system.

Weather Uncertainty

The degree of environmental control has completely removed a major locational determinant in some systems of production. The physical environment presents two management problems viz weather uncertainty and seasonality. If there is an uncertainty in the weather conditions, then there will be a complete damage to the crops. In this aspect, the arable crops are weather sensitive as they entail numerous field operations.

Seasonality

The demand for food by man and animal alike is largely seasonal while the economic and biological inputs and outputs of farming have a marked seasonality. The seasonal output pattern places an added advantage on efficient storage facilities. The demand for food by intensively grazed dairy cows is both substantial and largely seasonal whereas the rate of grass growth varies considerably between seasons. In addition to this, the seasonal variations in levels of production lead to varying market

prices, particularly for perishable but stable food for which there is a seasonal demand.

Factors Affecting the Form of Agricultural Activity

Four groups of factors determine the different forms of agricultural activities found in any region of the world. They are:

(1) Environmental

(2) Traditional

(3) Economic

(4) Political Factors.

(1) *Environmental Factors*

Environmental factors are the characteristics of the physical environment of a region. The climate, the geomorphology, the vegetation and the soil which combine to provide the ecological limits within which a particular crop may be grown.

(2) *Traditional Factors*

These are the factors related to the activities of the people through past ages and may condition acceptance of changes in agricultural activities. This may be indicated by the pastoralism of many generations who are frequently reluctant to accept cultivation. Traditional factors also cover the aspects of religions and social organisation which impinge upon agricultural activity.

(3) *Economic Factors*

These factors are related to the relative profitability of agricultural activities, but they are so frequently intermixed with politcal factors such as crop subsidies, crop insurance programmes, prize support programmes, etc. It is often difficult to distinguish between economic and political factors.

(4) *Political Factors*

Political factors include the governmental decisions aimed at assisting or retarding agricultural development. This also includes

all types of measures from direct subsidy and acreage limitations to the provision of scientific research for the improvement of agricultural production.

The environmental and traditional factors largely determine the economies of the underdeveloped countries of the world. This is because of the factors such as absence of mechanization or a very slow introduction of techniques and the poor exchange system, and other factors such as the farmer's selection of a particular type of crop and the relative success of his activities. Alternatively in highly developed economies, scientific knowledge, improved technology and capital investment have lessened the importance of environmental factors in agriculture by extending the area of minimum physical conditions for successful crop cultivation.

In understanding the agricultural evolution, it is clear that the shifting cultivation, as perhaps the earliest basic cropping system, spreading gradually over the inhabited earth in which Neolithic man learned to grow crops and could cope with environmental conditions. In this aspect that the shifting cultivation was the first system to employ different crop plants and specific cropping practices. With these plants and practices went other practices such as those related to control over land and cultivation rights kin-oriented labour, and strong continuation of appropriation from wild-food resource ranges. Eventually there appeared a different complex of practices and customs in which the most significant elements were the cultivation of permanent field and the development of a land-control system in which land and crops went together in what is termed 'agriculture'.

In the early development of crop complexes and cropping systems man in different regional sectors of the earth concentrated on particular groups of plants. It may be said that the basic cropping system of Neolithic South Eastern Asia can be said to be based chiefly upon the taro, yams, bananas and a series of other plants that reproduced by vegetative association. Similarly the cropping systems of South-west Asia came early to depend chiefly upon wheat, barley and a series of minor seed crops. Whereas in the new world, especially in the Middle America and its northern and southern margins maize, the squashes and a series of beans are cultivated.

The Agricultural Landscape

The agricultural landscape lends to talk about only the rural scene, the greenfields, the countryside. When the agricultural landscape is changed by man then it is referred to as a 'cultural, humanised landscape'. It is usually very different, from the actual landscape. In an agricultural landscape the most important features in it are those pertaining to man's farming activities, e.g. the field patterns, the walls and hedges, the farm steads and barns, the signs of tillage, the growing crops, the domesticated animals as well as, perhaps ponds, ditches and wind-pumps.

Types of agriculture

It must be important to understand the environmental conditions required for the successful production of particular crops, the economic conditions which favour or restrict production of these crops, and the political considerations which may override environmental or economic conditions to ensure the production or non-production of these crops according to the requirements of the particular national economy. Apart from the above, it is important to consider the cultural pressures which may inhibit or stimulate the farmer's response to changing economic and political considerations which cause him to alter the economy of his farm accordingly.

Various criteria used to classify the agricultural types are: the purpose of production, type of cropping or animal husbandry, farming techniques employed and the dependence on labour to perform farm operation, and the degree of capital investment in the farming enterprise. The purpose of production refers to the manner in which the farm products are utilized. Consumption of farm products by the farmer and his family is the basis of *Subsistence Agriculture*, whereas consumption of the farm product by outsiders involves exchange and this exchange is known as *Commercial Agriculture.* Some crops are sold by most subsistence farmers which is usually termed as *cash-cropping* in order to distinguish it from commercial agriculture of the above mentioned. The type of cropping or animal husbandry, or combination of both, notes only the predominant crops cultivated or animals husbanded.

For example, rice may be cultivated as a monoculture crop or in rotation with oats and pastures, because rice is the major crop in both cases. The farming system is designated as wheat farming. The scale of activity has been taken for granted so that in rice farming, which is undertaken over large areas of land, farm is normally regarded as a large-scale activity. Market-gardening, usually undertaken on small farms, is regarded as a small-scale activity. The scale of production of many types of agricultural activities makes some assessment of scale of activities available, especially the scale of operations for the same types of activities may vary greatly from one region to another region.

The extent of capital investment in farming equipment, buildings and commercial fertiliser, in relation to farm area and farm labour requirements, provides a measure of the intensity of land-use as expressed by such terms as *extensive* and *intensive*.

The environmental, cultural, economic and political factors are not static but changing in response to local, national and world situations. The nations emerging from an underdeveloped stage witness the political and economic factors in a state of constant change and pressures on traditional patterns of agriculture are very great. Consequently, the patterns of agriculture in these lands are changing rapidly and require constant reappraisal. In the developed economies, the established agricultural patterns are responses to relatively stable economic, political and cultural situations and changes are more in the form of trends, perceivable over a number of years, rather than revolutionary. In this, the political and consequent economic pressures are sufficiently great and changes may occur rapidly, which create crises.

In all types of agricultural activities there are five functioning farms:

(1) Crop and Livestock combination.

(2) Methods employed to grow crops and husband livestock.

(3) The intensity of application to the land of labour, capital and organisation.

(4) The method of disposal of the farm products.

(5) The farm buildings and structures commonly found necessary to carry on the agricultural activities.

The critieria mentioned above is used for the classification of agricultural types. There are many types of agriculture. Some are advanced and some are backward; some are concerned with the production for small, local groups, some with the production of crops and animals for national and international markets. There is a wide variation in the practices of agriculture. These may be accounted as follows:

(*a*) In some areas tillage is carried out in a primitive way, with hoe, wooden plough and digging stick whereas in others the agriculture is highly mechanised with sophisticated modern machineries such as tractors, combined harvesters, threshers etc.

(*b*) Some areas are concentrated in producing a wide variety of crops, in others attention is devoted to a single main product.

(*c*) The farmers own their land in some of the places, in others they rent their farmland or work it as share-croppers i.e. in return for their owning land and perhaps seed and implements they hand over a proportion of the crop, they grow, while in yet others the land may be owned by the State.

(*d*) Occasionally the farm plots are diminutive in size, sometimes hundreds of square miles in extent. Here the size of the farm determines the nature of the agricultural activities, and the agricultural operation practices. It is observed from the agricultural types that there is a great diversity of methods, patterns and products.

There are different agricultural regions which are grouped on the basis of agricultural activities, practised in different regions. These are as follows: (Fig. 3.2).

1. Nomadic Herding.
2. Livestock Ranching.
3. Shifting Cultivation.
4. Rudimental Sedentary Tillage.
5. Intensive Subsistence Tillage with One Crop Dominant.
6. Intensive Subsistence Tillage without a Particular Crop.

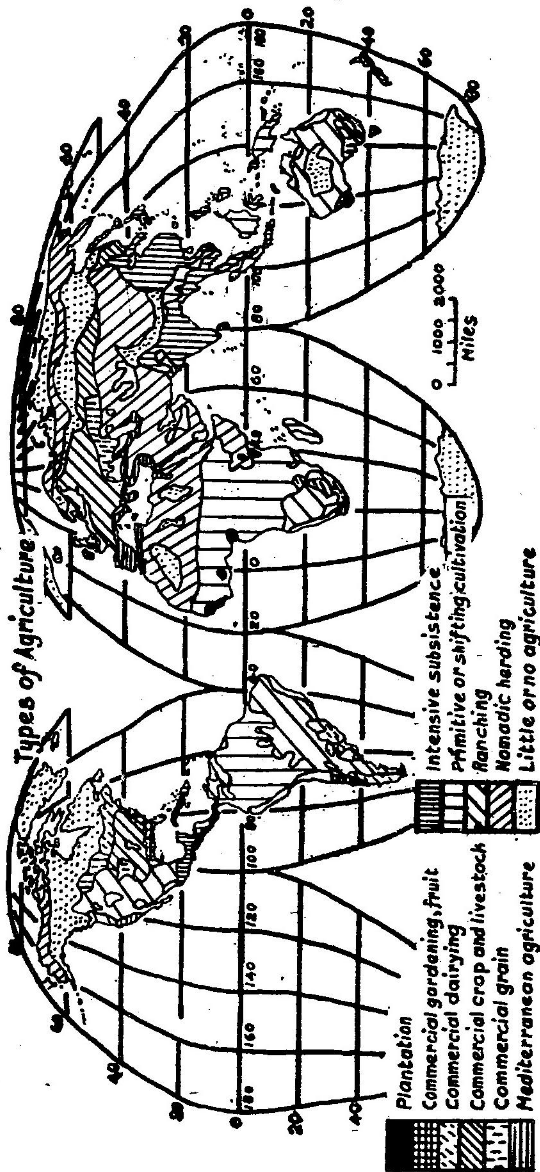

Types of Agriculture
Plantation
Commercial gardening, fruit
Commercial dairying
Commercial crop and livestock
Commercial grain
Mediterranean agriculture
Intensive subsistence
Primitive or shifting cultivation
Ranching
Nomadic harding
Little or no agriculture
0 1000 2000
Miles

FIG. 3.2

7. Commercial Plantation Crop Tillage.
8. Mediterranean Agriculture.
9. Commercial Grain Farming.
10. Commercial Livestock and Crop Farming.
11. Subsistence Crop and Stock Farming.
12. Commercial Dairy Farming.
13. Specialised Horticulture.

1. *Nomadic Herding:* This type of agricultural practice includes entirely the livetock herding. It is although not uncommon for nomadic herders to plant small area of cereals in more favoured situations. The types of livestock vary from region to region and particularly it includes more domesticated herbivores. Pastoral nomadism involves the almost constant movement of people and their animals, the animals in a cyclic pursuit of pastures and water, the people in pursuit of the animals. This may be exemplified by the Indian peoples who do this with the caribou in the far-northern latitudes; the Masai live with their cattle on the very equator in East Africa. Especially in the case of Masai, the nomads do build their settlements in an area to which they return seasonally when the rains break. When the drought comes they move up slope with their cattle, where it is cooler where the moisture lingers longer. This process of seasonal migration of livestock accompanied by the herdsman in pursuit of suitable pastures is known as '*Transhumance*'. Transhumance is a form of cyclic migration, but it is not confined to vertical movement.

Very few nomadic peoples are actually 'pure' pastoralists. Often attempts at cultivation are made because of contraction of the grazing region and resulting problems of overgrazing and general dislocation. Pastoral nomadism is not only confined to Africa, but it is also found from China to Russia to North Africa.

The methods used to cultivate crops and produce livestock may be determined by the following facts. They used the animal husbandry methods very simple involving little scientific knowledge. The stock are commonly of poor quality with high incidence of diseases excepting from transport of animals. The land is mainly owned by tribal groups and stock movement is associated with

sub-tribal and family groups.[1] Stock movement may be of well-defined patterns or by seasonal requirement.

As far as the intensity of application to land of labour, capital and organisation are concerned, it reveals certain facts, *i.e.* the land is the major resource input for production. Because of location of this activity in regions of harsh climate, land must be used very extensively. Labour, capital and organisation are limited to the resources of tribal group. Capital is limited and labour and organisation are found to be traditional. Greater part of the production is consumed by herders themselves. Sometimes, the surplus animals or animal products are bartered for cereals, beverages, metals and firearms. The presence of farm buildings signify certain aspects i.e. apart from permanent watering fixtures and stockyards or corals, there is no permanent buildings for them. They construct the portable tents to suit climatic conditions which may form the shelter place for herdsman.

2. *Livestock Ranching:* This involves the association of both crop and livestock. The major types of livestock include sheep, cattle, goats and horses. The land used in this activity is particularly superior to that for nomadic herding but marginal for commercial grain cropping. Some of the grain crops may be grown along moisture origins with reference to hay. The nature of the livestock is an introduced one or atleast 'improved' by introduction of European stock and scientific breeding methods. The method of practice of sedentary form of occupancy is based on the use of the land by individual owners or lessees. They are usually of European traditional culture. The methods of husbandry vary widely but they are commonly based on open range grazing. It is significant to note that techniques are more advanced and more intensive than for nomadic herding. Permanent land occupation and use of modern transport means distinguish livestock ranching from nomadic herding.

This type of farming is generally regarded as an extensive form of land-use with low capital, labour and management inputs a unit area of land, although the total capital investment may be high. The efficiency of management differs considerably, but commonly higher in temperate regions where problems are fewer. In addition to this, the fixed capital facilitates variety of farms,

fences, permanent water supplies, dips and stockyards. Animals are raised for highly organised markets and even at many times the animal products may involve international trade. The production tends to be highly specialised to meet the outside of the local markets. Where beef production is the aim, stock commonly have to be fattened elsewhere.

The production units are large and ranch or homestead frequently serves the function of small town. The noteworthy farm buildings include major homestead, stores and equipment sheds, workmen's quarters, stockyard and dipping facilities, shearing shed, out-station buildings and water pumping equipment.

3. *Shifting Cultivation:* Shifting cultivation was the first system to employ different crop plants and specific cropping practices. In this type of agricultural practice the farmers would move on to another parcel of land, clear the forest and try again. The practice of shifting cultivation, like hunting and gathering still goes on. Shifting cultivation forms a way of life for many more people than hunting and gathering. Between 150 and 200 million sustain themselves in this way in Africa, Middle America, tropical South America, and in places like South-East Asia. The process involves a kind of natural rotation system in which areas of forest are used without being permanently destroyed.

Crop associations may vary with climatic conditions but include a variety of heavy starch produces: Cassava, Bananas, Sweet potatoes, Maize, Sorghums etc. Animals play only a very limited part but animals like pigs, poultry, goats and cattle are included. The land is acquired for cultivation after clearing of forest or woodland generally by fire after rudimentary cleaning with hand tools. The tillage methods are primitive because it is based on hand tools from dibble stick to hoe. Similarly the cultivation methods are also primitive. The Bush fallow system is a wide-spread one in which it involves clearing and cultivation for several crops, then returning to natural vegetation.

In this practice of farming, the area of the land cultivated is dependent upon labour supply and food requirements. Labour provides a major resource input and is intensively utilised to small areas of land. The organisation of land and labour varies on non-economic basis. The low yield, is mainly determined by the

small investment of capital. In subsistence economies, no surplus is found for sale. The isolated nature of shifting cultivation settlements combined with low yields have prevented wide-spread social contact of these peoples and consequent development. They construct temporary or semi-permanent structures for minimum shelter and storage facilities and it is also found that the buildings are limited in number and degree of elaborateness.

4. *Rudimental Sedentary Tillage:* This type of practice is similar in most respects to those of shifting cultivation. The greater degree of permanence of settlement admits more place for livestock in association. A significant feature here is the appearance of subsistence crops frequently supplemented with cash crops esp., tree crops: Cocao, Coffee, Oil Palm, Coconut Palm and Rubber.

Clearing and cultivation follows a closer time pattern thus total area a person required is less than for shifting cultivation. Though the tillage methods may still involve hand tools, the system is designed to maintain soil-fertility through cultivation and manuring techniques. This type of agricultural practice usually involves both the rotation of crops and rotation of cultivated areas.

The area of the land available for cultivation is so much so limited because of the pressure of population and hence the labour should be intensively applied to land. The tools are commonly more advanced than those of shifting cultivators because of the participation in cash-cropping and the possibility of purchasing ready-made steel tools. The organisation is frequently on less than a tribal basis, with clan ownership of land and family organization of cultivation.

The major aim of the cultivation is to provide subsistence crops throughout the year. Cash crops usually form separate component of cultivators' activities and income. The farm buildings are commonly congregated in villages with temporary shelters in further most cultivated areas. The houses are of semi-permanent and even sometimes permanent occupation.

5. *Intensive Subsistence Agriculture with One Crop Dominant:* Of the world's three billion people, nearly one-third support themselves by intensive subsistence farming. The subsistence farming is usually defined as the farmers who grow enough food to

sustain themselves and their families, who use their natural habitat to find building materials and firewood and who do not enter into the cash economy of their country at all, but who sometimes sell a small quantity of produce. The intensive methods involve much labour and/or capital permit area cultivated. Such methods usually imply an absence of fallow, much use of fertilisers, carefully planned crop rotations, the use of specially selected seeds and the specialised and scientific breeding of animals.

In the case of one dominant crop rice may form in association with tuberous roots, leaf vegetables and pulses, till rice and other grains. Buffalo and oxen are kept for draught purposes. The majority of the field work is done by hand with simple tools. The irrigation systems for paddy cultivation is usually primitive in its nature. There is a short supply of land in most regions of paddy cultivation. It has led to intensive system of double cropping, reclamation schemes and resettlement schemes. Labour is found to be plentiful and is used to substitute for land and capital. Capital is generally limited to small irrigation works but areas of complex irrigation systems are being developed and cultivating machines are making impact on wealthier rice growing regions. The majority of farmers grow own food requirements, limited cash-cropping and sale of surpluses are common in many regions. The intra and international trade for rice is decided by the interference of the government in restricting the price paid to farmers. Within these regions there is a competition of cash crops with subsistence crops. These may include industrial crops such as Cotton, Jute, and Plantation crops. In communist China, all agricultural activities are becoming increasingly commercialised. This is mainly due to the direct government intervention with peasant system. The structures of the farm houses are permanent but quality and type vary with available materials, degree of commercialisation and climatic conditions.

The intensive farming may be referred with suitable examples:

In Denmark the most economical methods of farming are employed to get the maximum return from the land and the animals. The soil is efficiently utilised to produce grain, roots and other animal feed stuffs. Great attention is paid to breeding, feeding and milking. A successful co-operative system can be able to buy

feeding stuffs, fertilisers, machinery in bulk and therefore, very cheaply.

In the case of Japan the patch of land is closely cultivated and slope land brought into tillage by terracing. Irrigation is practised in Southern Japan and three crops of rice are harvested from the same field each year. The catch crops are sown either between the rows of main crops or in the short period between the harvest of the main crop and the sowing of a second. The intensive use of the land is determined by the non-availability of land.

6. *Intensive Subsistence Farming without a Dominant Crop:* In this type of farming the physical conditions prevent growth of paddy, rice replaced by other grains, such as barley, maize and root crops, vegetables and pulses. The livestock association is similar to those of intensive subsistence tillage with rice dominant. The irrigated paddies are not so common because it is replaced by non-irrigated farming with supplementary watering. Cultivation methods and tools are similar to those regions dominated by paddy cultivation. Because of the population pressure, the land supply is short in this type of region. The opportunities for double cropping is not so common as in rice dominant lands. The capital investment is similar to rice dominant regions with more emphasis on machinery. Farm organisation is similar to rice dominant regions. The disposal of products is similar to rice dominant regions. In Communist China, the change towards commercial cropping is similar to rice dominant regions, with some attempts at large scale production of wheat in Manchuria. The farm buildings are similar to rice dominant regions in many respects.

7. *Commercial Plantation Crop Farming:* This type of activity is developed primarily to supply industrial nations of mid-latitudes with tropical crops. The term plantation brings to mind a huge, productive, comparatively modern enterprise, where the work is done by local people and the owner and his family live in an elaborate comforatable mansion of beauty and style. The plantation agriculture transformed whole areas of the world from subsistence to cash cropping; it caused large areas of land to be taken from their indigenous areas; it helped to generate

enforced migrations of millions of people for labour purposes; it further generated enormous wealth for some of the plantation owners (companies as well as individuals.)

The important quality of plantation is its size. Plantations are often quite extensive, much more larger than farms. Plantations are owned by private individuals or by corporations.

The plantations are characterised by large scale methods to produce large quantitites of industrial crops of similar quality. Methods include highly specialised division of labour, scientific agricultural techniques and expensive capital equipment for initial processing. New methods are often speedily adopted and technological facilities such as refrigeration have extended the range of crops and regions amenable to this farm. The labour is applied intensively under a factory-like system. Where insufficient labour is available, the labour is recruited from external sources. The whole purpose of plantation agriculture is to dispose of crops to industrial mid-latitude nations. Plantation forms part of chain of vertical integration within a farm providing consistent supply of crop.

The methods and tools of farming tend to be more complex than those of the smaller farms. Plantations, unlike farms, often have equipment to process the produce prior to shipment. This makes the plantation more of an industry than the farm normally is. Plantations are clearly a discrete form of land use. There are many kinds of plantations, but those with the greatest impact were located in populated areas of America, Africa and Asia. Apart from generating enforced labour migrations, they even occupied good agricultural land and pushed hundreds of thousands of people who might have remained subsistence farmers into the money economy. Plantations do not cover large areas of the world and never did. They did come to extend over much of the Cuba and Puerto Rico, coastal north-east Brazil, lower areas of Venezuela and Columbia, and Middle Africa. In Africa, they developed in coastal parts of East Africa and relatively small sections of West Africa from Senegal to Nigeria. In Asia, there are tea plantations of Assam (India) and Sri Lanka (Ceylon), the sugar estates of Java and the Philippines, and rubber plantations of Malaya.

8. *Mediterranean Agriculture:* This type of agriculture is noted by major four component activities (*a*) Winter crops grown with rain (cereals); (*b*) All year crops grown with rain (tree crops and vines); (*c*) All year or summer crops grown with irrigation (vegetables); (*d*) Livestock grazed on highlands in winter and lowlands in summer (sheep, goats). The regions of Mediterranean agriculture are specialising increasingly in commercial production of fruits and early vegetables especially in North America. The Old World Mediterranean lands are typified by small peasant holdings with both subsistence and commercial crop components. In some areas, large estates or *latifundi* are based on commercial wheat production and sheep grazing. Transfermande grazing is common where these regions border or include mountainous and forested regions. The scale of agriculture is considerably larger in New world regions.

The old World Mediterranean regions are still characterised by intensive employment of labour, although consolidation of holdings, small tractors and increasing commercialization gradually changing the relation between labour and capital; whereas the New World Mediterranean regions are highly mechanised, but horticultural products still require high involvement of labour.

The traditional high degree of subsistence cropping of Old World Mediterranean regions are rapidly breaking down as demands for early fruits and vegetables by North-west European Industrial countries increase. In the New World Mediterranean regions, the production is always on commercial basis with the exception of Chile.

The settlement patterns and farm building arrangements of Old World Mediterranean regions retain many local characteristics. In the case of New World farm buildings, they are typical of most irrigation and horticultural districts, with farm house, machinery sheds and storage sheds in cluster on farm.

9. *Commercial Grain Farming:* In this type of farming, the principal crop is wheat, normally in rotation system with cereals and pasture or fallow. The extent of animal husbandry associated with this activity varies considerably from true monoculture to bordering mixed farming associations. It is commonly associated with large scale farming and extensive cultivation methods. It

has proved especially adaptable to mechanization and few cultivation and harvesting activities are not carried out by machines. The animal production in conjunction with grain farming tends to be specialised. *e.g.* Australian grain farmers universally graze wool-sheep, whereas North American grain farmers produce store beef cattle. The scientific cultivation techniques and wheat breeding have extended wheat cultivation into regions of dry climates and short growing seasons. This type of activity is regarded as an extensive agricultural activity despite high degree of mechanization common in all regions. Mechanization has reduced labour requirements and increased size of farming unit required. The total farm production of wheat in these regions is for sale as grain and frequently consumed thousands of miles from production region. The international wheat agreements are designed to reduce severely fluctuation in price. The farm buildings are complex and they are traditionally located on farm. Feature of farm buildings complex are large machinery sheds and used as temporary storage for grain. The elevators of wheat storage before shipment are integral part of landscape.

10. *Commercial Livestock and Crop Farming:* This type of mixed farming is dependent upon cereals, roots and vegetables with same mixture of dairying and pig-raising. In the case of North American mixed farming, it is traditionally based on maize, but soya beans, sorghums, and small grains which provide greater variety of crops for rotation purposes. The most important forms of crop cultivation are the beef fattening and pork raising. The percentage of cropland to farmland is higher than for commercial grain farming, but intensity of stock production is much greater.

The European mixed farming is traditionally based on very small farm units which are frequently divided into a number of separate holdings. A degree of subsistence activities is common. In recent years the European mixed farming regions, especially in Communist bloc countries, are witnessing number of changes *i.e.* increases in farm size, consolidation of holdings, mechanization, greater crop specialization and corresponding reduction in subsistence activities. Whereas in North American mixed farming the region provides epitome of modern farming such as the application of scientific methods extensively, development of mechanization

to the extreme and increasing nature of the farmers' income. In all regions of commercial mixed farming, the application of labour and capital to land is very intensive. In addition to this, the farming activities are becoming increasingly mechanized with increasing usage of artificial fertilizers. Apart from the small regions of intensive horticulture in North West Europe, the mixed farming regions provide some of the highest rural densities of population for lands of European culture. The occurrence of large industrial markets form the potential customer for the mixed farming products. Europe has witnessed the high degree of collectivization since World War II and has emphasized the commercial aspects of crop disposal with compulsory government quotas to be filled for most crops. It is important to emphasize that the mixed farming regions of North and South America are essentially commercial in nature in which the South American region is highly involved in international trading in both animal and grain products. The two most extensive regions of mixed farming are in Eurasia and the United States. Of which the United States account the mixed farming as the second most extensive type of agriculture. The farm buildings include folder storage units, stockyards, stalls for winter feeding and machinery sheds. In both north and south America, the stockyards for sale of stock, and railroad facilities for stock movement in association with packing houses form major cultural items in the landscape.

11. *Subsistence Crop and Stock Farming:* This type of activity was found in Pre-world War II days in Eastern Europe and the U.S.S.R., North Middle-East and Mexico. The increasing pressure on peasants made to collectivize holdings in U.S.S.R. and later in most communist bloc countries of Eastern Europe where it was greatly reduced the subsistence element but at the same time increased the advantages of mechanization and large scale farming techniques. The peasant subsistence element is strong especially in Eastern Europe. In the case of South Mexico, it has shared in overall increase of Mexican standards of living, and becoming more commercial in outlook and organisation. The subsistence mixed farming can be also applied to regions of Middle East in Turkey, Iraq, and Iran. Even in these countries improved transport, development of mineral wealth and improving living standards are changing the emphasis from subsistence to com-

mercial activities. The principal crops include cereals (barley, wheat most important) with some root and leaf vegetables and oil seeds. Animals chiefly include sheep and goats of uniformly poor quality and they are mainly used for wool, hair and milk.

The cultivation and threshing methods are primitive and dependent on manual and animal power. Transportation has improved, but carts still provide major method of getting cash crops to market. Seeds and animals are poorly bred and husbanded, commercial fertilisers are unknown and animal fertiliser is too limited for widespread fertilisation of crops. Labour is applied intensively to culivated land, but little attention is paid to grazing land. Capital is in short supply for all farms. Small cash crops are marketed in local urban centres whereas the bulk of the farm produce is consumed by farmer and family. The farm buildings are generally poor in quality and few in number.

12. *Commercial Dairy Farming:* The dairy farming is based on the utilization of permanent pastures with supplementary feeding of hay and silage during winter. Some of the most highly developed dairy regions are entirely dependent on high quality hays because the farmers have no other cash crop. The city supply regions are generally higher cost producers depending upon imported feeds to provide majority of stock feed. The methods of livestock–husbandry can be broadly divided into two groups.

(1) Cows largely stall fed on imported feed.

(2) Cows grazed on pastures, with or without supplementary feeding. The dairy farming remains labour intensive one, despite considerable investment in milking machinery and feeding, and silage and hay making equipment. Traditionally, the dairy farms have been small scale family units. Recently, trends have been towards larger units. Heavy investment is put in building winter. The milk factories are frequently co-operatively owned. These form the major part of local and regional organization of dairying regions. There is a high degree of commercialisation in all regions of dairy farming. The farmers usually prefer sale of whole milk because of greater profitability. Large part of world's milk production is devoted to manufacture of butter, cheese and condensed products.

The major dairying regions are as distinct from city supply regions which are mainly concerned with production of manufactured products which may be marketed at considerable distances from production region.

The farm buildings of North America and European regions are characterised by large barns and feed receptacles to shelter and feed stock during winter. Usually the Austalian dairy farms have few buildings beyond dairybails and hayshed. Dairy factories are widespread, forming an integral part of the regional landscape.

The principal dairying areas are :

(*a*) *North-western Europe:* Dairying is highly developed in many parts of the Atlantic fringe, especially in Denmark, Holland and Britain and to a lesser extent in Erie, Northern France, the North sea coast lands of West Germany, parts of Norway and Central Sweden. It is also significant with Alpine region. The large ndustrial urban populations of the United Kingdom and West Germany have provided big markets. Denmark specialises in butter production, whereas Holland and Switzerland are famous for cheese.

(*b*) *North-eastern United States and the St. Lawrence Lowland of Canada:* The northern Atlantic coastlands are familiar in the production of milk. The cities include in this line are Boston, New York, Baltimore and Philadelphia. States farther west such as Michigan, Minnesota and Wisconcin have a smaller milk sale and they tend to concentrate on butter and cheese.

(*c*) *New Zealand:* New Zealand has become one of the important dairying areas in the southern hemisphere because of the availability of well-watered plains of North Island. The dairying industry has been greatly established due to the availability of refrigeration facilities. The United Kingdom imports large quantities of butter from New Zealand. The equable climate of New Zealand facilitates the animals to be kept out-of-doors all the year round and there is a little requirement of feeding stuffs in such climatic conditions.

13. *Specialised Horticulture:* This form of activity is dependent upon cultivation of perishable fruits and vegetables for wealthy urban markets. This farm like dairying has become distinctive

only after the introduction of refrigeration and rapid railway transport. There may be regions which are specialised in particular fruits such as citrus or vegetables or combinations of both.

The methods have traditionally been small-scale and intensive. It is mainly characterized by its attention to industrial plants. This type of farming yields high returns. Methods have often involved irrigation and glass house techniques. Sometimes hot-houses are also used. The methods employed in this type of farming is mainly determined by its location in relation to markets. Their situation near markets is often needed to overcome climatic disadvantage (*e.g.* by glass and hot-houses). In this way the markets are able to provide the natural advantages which allow the less expensive techniques.

The labour, capital and organisation are applied intensively to land. The introduction of mechanization slowly removes the traditional hand methods of cultivation. Certain cases witness the adoption of large-scale techniques, *viz.*, crop specialisation, adoptation of special picking equipment, specialised transport etc. Since the products are perishable in nature, the organisation of harvesting, transport and marketing are tightly knit. The farming exhibits a high degree of commercialisation for all types of products. It also witnesses a high degree of specialization of cropping and specialization of market in most of the regions. Rapid with refrigerated transport has made a great impact thus by way of allowing regions distant from markets to compete with local regions, particularly in trade out of season, and early and late crops. The farm buildings include apart from glass and hot-houses, few buildings devoted to vegetable production, special packing necessitating sheds as farms or central to a number of farms. Farm houses and farm workmen constitute the market gardening (truck farming).

Agricultural Production

The above mentioned thirteen types of agricultural occupancy summarise the more important characteristics of the farms of the agricutural regions of the world. Since agriculture is the most important occupation in the world as a whole, importance has to be given to discuss with certain aspects like the type of agriculture

in any area, the degree to which it is developed and the crops that are cultivated as well as its international and internal standard for export. These above mentioned may be determined by the following factors.

Factors Controlling Agricultural Production

(*a*) *A Market for the Produce:* This is the most important factor. There is no point in producing a commodity unless there is a market for it. The market may be for the farmers' own family or a nearby market town, or by a large city with vicinity or more distant part of his own country, or by one or more foreign countries.

(*b*) *A Remunerative Price:* The producer must sell his produce at a profit otherwise he will eventually go bankrupt. World prices for most produces vary considerably from year to year and the farmer may be badly hit if the prices are lower than he expects.

(*c*) *Adequate Communications:* The farmer must have efficient and reasonably cheap means of transport to enable him to dispose of his commodities at no time.

(*d*) *Labour Supply:* The organisation of labour, especially in large estates is a matter of greater importance.

(*e*) *A Suitable Climate:* Every crop has certain climatic requirements and the cultivation of a specific crop is largely determined by the climatic conditions. Upon the climate largely depends the kind of agriculture practised, *e.g.* whether cereal cultivation or grass and fodder crops will be predominant; whether beef-cattle or dairy-cattle will be reared, whether 'wet' crops like rice or 'dry' crops like millet will be grown.

(*f*) *A Fertile Soil:* Soil of the most temperate lands which are not too wet are usually richer than those of cold areas and hot-wet tropical lands. The structure and characteristics of the soils will determine the fertility of the soil. The structure, texture workability and fertility will also affect farming and types of farming.

(*g*) *Social Custom:* These, such as religious influence, may exercise a strong influence. For example, the practice among some peoples of sub-dividing land upon the death of the owner has led to excessive fragmentation. The social prestige of cattle in the

African Savanna lands, the Hindu veneration of cattle, and the Moslem attitude towards the pig explains the effect of social customs upon animal husbandry.

(*h*) *Political Factors:* Government have sometimes introduced tariff's bounties or subsidies to persuade or compel farmers to produce commodities in accordance with national needs.

Limits of Crop Production

There are certain conditions which determine the specific crop production in an area. Three different limits of production are (*a*) geographical limit, (*b*) the economic limit, and (*c*) the actual limit.

1. *Geographical Limit of Production:* This includes the climate, soil and terrain. The most important of which is climate, necessary for the growth of any particular crop. For example, the cotton cultivation is limited on the north by the two hundred consecutive frost free days time and by the 77°F (25°C) isotherm for the three summer months. On the west it is determined by the 50 c.m. of annual rainfall isohyet, and on the south and east it is mainly by the 100 c.m. rainfall line.

2. *The Economic Limit of Production:* The economic reasons may sometimes form one of the factors to determine the possibility of a crop to grow. These are :

(*a*) the plant yield may not be insufficiently low to justify its cultivation,

(*b*) the type of labour required may not be available in the area,

(*c*) lack of adequate transport facilities,

(*d*) competition from another crop, perhaps of greater value, may be a limiting factor,

(*e*) the likely occurrence of a plant or animal pest or disease may affect the production.

It is important to consider that the economic limits of production may change in response to changing economic conditions. Increased demand may lead to the expansion of the economic frontier.

3. *The Actual Limits of Production:* The actual limits of production may be more *narrowly* demarcated. This may be cited by the Nigerian Cocao industry. There is a wide belt of equatorial rain forest in Southern Nigeria with high temperatures and plentiful rainfall which permit the cultivation of the Cocao tree while economic production is feasible throughout much of this zone; yet the actual present-day limits of the production are relatively small, the Cocao growing area being centred upon the city of Ibadan. The graph of economic activities (Fig. 3.3) clearly distinguish the various types of economic activities in different countries.

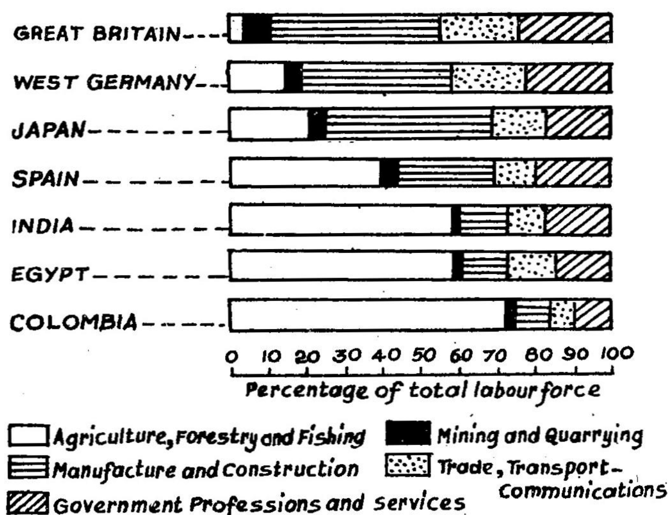


FIG. 3.3 Graph of Economic Activities

Foodstuffs from Plants

The produce derived from agriculture can be broadly divided into four, *viz.*:

1. Grain crops or Cereals.
2. Other Cereals.
3. Food Crops—Vegetables and Fruits.
4. Industrial Crops.

Cereals

Cereals are the chief food crops of man and are widely consumed as food stuffs. The importance is mainly due to the supply of greater part 'caloric-intake' and the yield highly per unit of area cultivated. The principal cereals are rice, wheat, barley, oats and rye. The wheat, barley, oats and rye are grown mostly in cool temperate lands; maize which needs a warmer climate is known as a sub-tropical crop; rice and various kinds of millets are mainly the products of tropical regions.

Rice

Rice is essentially a tropical or subtropical crop and can only be grown where the climate is hot and moist, unless it is grown by irrigation. There are two chief types of rice: (i) Upland or 'Dry' rice and (ii) Paddy or 'wet' rice. Upland rice is relatively unimportant and most of the world's rice is grown on flooded lowlands. Its high productivity, together, with the great demands it makes on labour, make it a crop well-suited to the populous lands of eastern and southern Asia (Fig. 3.4).

Geographical Requirements

Although rice is grown under differing conditions, the primary requirements are as follows:

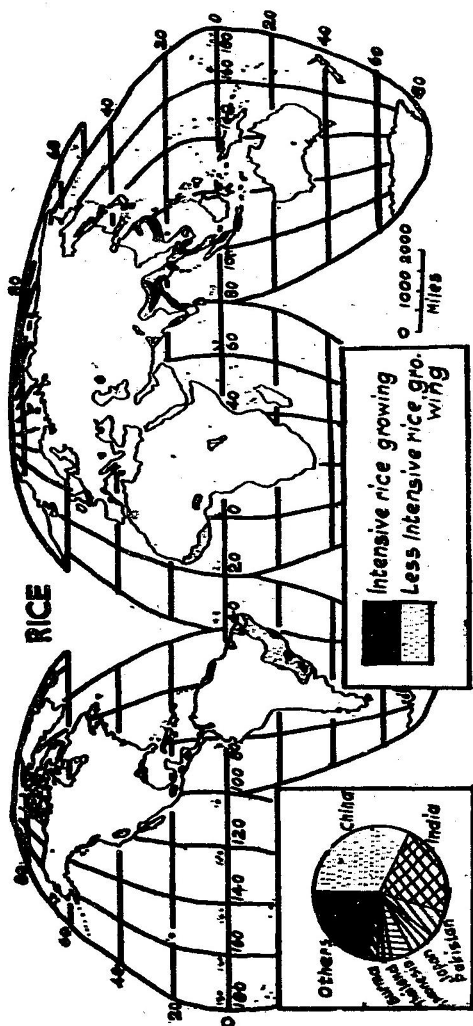
(*a*) *Level Land with an Impervious Sub Soil:* Since the plant spends most of its life under water.

(*b*) *Abundant Moisture:* This means 150 c.m. or more of rain or compensating irrigation water.

(*c*) Temperatures between 60°F and 68°F (16°C and 20°C) during the growing period and exceeding 75°F (24°C) during the ripening period are required.

(*d*) *Alluvial Soils* are to be preferred as well as to be replenished to enrich the fertility of the soil.

(*e*) *Supply of Cheap Labour:* Since the sowing, transplanting and harvesting involves tedious nature of human labour, a plentiful supply of cheap labour is essential.



Distribution of the production of Rice - 1987

FIG. 3.4

Methods of Cultivation

Rice is dominantly grown in the monsoon lands by traditional methods. More modern methods are used elsewhere.

(1) *Monsoon Asia:* Paddy cultivation is highly concentrated in almost all the coastal lowlands and wet alluvial valleys. In many areas the cultivation has been extended by terracing hill slopes. Oriental farmers divide the land into small compartments or basins so that they can be easily filled either by heavy monsoon rains or the collection of the irrigation water from ditches filled from rivers. The water is drained off when the rice plant reaches the ripening stage. In most Asiatic countries, apart from ploughing which is done by oxen or water-buffaloes, nearly all the farming operations are done by hand only. The yield in Japan is significant because of the natural fertilisation.

(2) *Other than Monsoon Regions:* The places other than monsoon regions include Louisiana in United States and the Rhone delta in Southern France. Rice is here grown by mechanised farming methods which contrast sharply with those of traditional methods. Yields are found to be highest in Italy and fairly high in the United States where improved seeds are often used.

TABLE I

Rice Production in 1976

Country		Production (Million Metric Tons)	Percentage of World Production
China	...	116.5	34.0
India	...	68.0	19.8
Indonesia	...	23.0	6.7
Bangladesh	...	17.8	5.2
Thailand	...	15.5	4.5
Japan	...	15.3	4.4
Vietnam	...	11.5	3.3
Burma	...	9.4	2.7
Brazil	...	9.0	2.6

Trade in Rice

Of the world total production of some 250 million tons, approximately the same as wheat, about 95% is consumed in the country of its origin. Only a very small fraction of the output enters into the international trade and most of the trade is carried on between the countries of Monsoon Asia, from rice-surplus to rice-deficit areas. China grows about a third of the world's production and India nearly a quarter. But both of them have not been able to spare. Burma, Thailand and Kampuchea are the chief exporters. Their surplus usually goes to Sri Lanka, Malaya and other lands. A recent trend has been the export of rice to the Far East from the Western hemisphere. A new feature in the world market is the appearance of United States as an exporter (on small scale).

WHEAT

Wheat is a species of cultivated grass. Wheat is cultivated under different conditions.

(*a*) *Cool temperate lands:* Wheat is usually sown in autumn.

(*b*) *In continental interiors* which have extreme climate where it is spring-sown.

(*c*) *In hot tropical lands:* There it is grown often with irrigation, as a winter crop.

Essential Geographical Requirements for Wheat Cultivation

The necessary conditions for wheat growing are:

(*a*) A fairly stiff, preferably loamy and non-acid soil.

(*b*) Mild, moist weather during germination and the early growing season.

(*c*) A temperature of at least 60°F (16°C) and sunshine for ripening.

(*d*) A frost-free growing period of approximately 100 days:

(*e*) Level or undulating land to facilitate mechanised operations if the wheat is grown under the large scale extensive system.

Wheat is tolerant to considerable temperature and rainfall variations. It grows in the hot and fairly dry summers of the temperate grass lands and in the hot dry 'Mediterranean' lands. Wheat grown under such conditions is known as 'hard wheat'. It is rich in protein and excellent for bread-making. Wheat may be grown with a mean annual rainfall of less than 40 c.m. and under dry farming methods with as little as 20 c.m. of rainfall a year. In Western Europe, where summers are moist a soft wheat is produced; this is a starchy grain, hot, very good for bread-making but suitable for preparing cakes and biscuits.

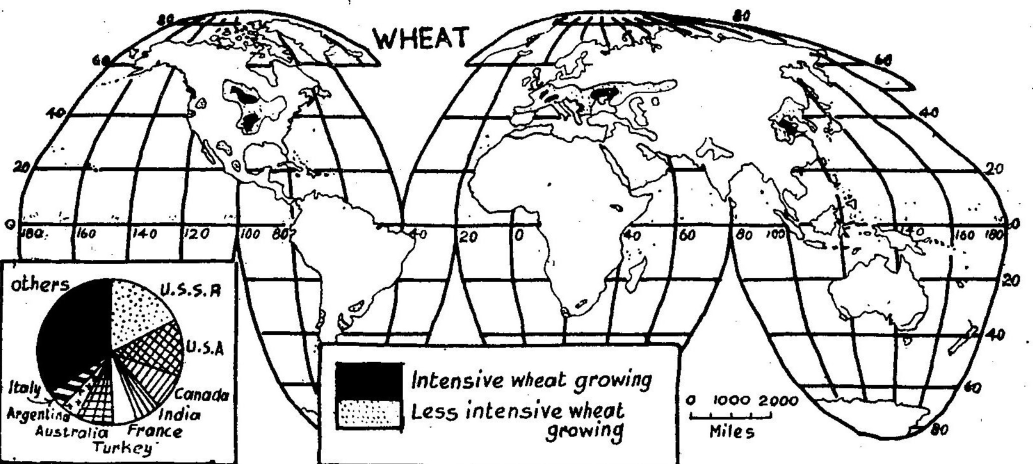
Wheat Production

Yields per acre are highest on the intensive farms of Western Europe and in Denmark. Yield may be as high as 44 bushels per acre. Wheat can be rightly called a 'robber crop' quickly exhausting the soil. Under the intensive farming system, it is normally part of a four-year rotation. For areas of extensive farming, as in the Canadian prairies or in Argentina and Australia, the yield per acre may be low 15 to 20 bushels. The output per man is high in these countries because of the great use of modern machinery. The poor methods of farming in India and Pakistan characterise a low yield (Fig. 3.5).

The temperate grasslands of the Soviet Union grow nearly one-quarter of the total world production of wheat. North America accounts for roughly one fifth of the United States growing slightly more than double that is grown in Canada. China comes as another major producer and she grows the same amount as the United States, about an eighth of the world total. India, France, Spain, Turkey, Italy, Argentina and Australia are all significant producers growing around a million tons a year about one-twenty-fifth, a piece of total world production.

International Wheat Trade

The temperate grasslands of the United States, Canada, Argentina and Australia grow large quantities of wheat for export. This is mainly because of the low density of population and hence have a big surplus to spare. Most of their export goes to western Europe, especially the United Kingdom. At one time Russia was a major



Distribution of the production of wheat - 1967

FIG. 3.5

exporter, but during recent years the Soviet Union has occasionally had to import wheat. Both China and India have begun to import wheat because of the rapid growth in their populations. Wheat accounts 6% of the United States exports by value and for 12 to 14.1 in Canada.

TABLE II

Wheat Production—1976

Country		Production (Mill. Met. Tons)	Percentage of World Production
U.S.S.R.	...	95.0	23.0
U.S.A.	...	57.8	14.0
China	...	43.0	10.5
India	...	27.0	6.6
Canada	...	23.0	5.7
Turkey	...	16.5	4.0
France	...	15.8	3.8

OTHER CEREALS

Millets

Millets cover a wide variety of species of cultivated grasses which form the humblest members of the grain crops. They are of a low grade food, and their cultivation is an indication of a low standard of living. Millet forms the chief grain crop in sub-tropical and tropical regions of light rainfall where water supplies are insufficient. The main cultivated varieties are:

(*a*) *Sorghum* or *Great Millet* which is much grown in Africa and is variously called luna and guinea corn; in India it is termed 'Jowar'.

(*b*) *Bajra:* A smaller spited plant, which is important in India and Pakistan and it occupies a considerable acreage in the drier parts of the two countries.

(*c*) *Kaoliang:* A giant millet, which is grown in northern China and Manchuria forms a valuable animal and human food.

The other important cereals are barley, oats and rye.

VEGETABLES AND FRUITS

Vegetable Food Stuffs

Vegetables, particularly the leafy green vegetables, are necessary for good health since they contain vitamins. The chief vegetables can be broadly divided into four categories. They are:

Starchy tubers.

Root vegetables.

Pulses.

Green vegetables.

Starchy Tubers: A number of starchy tubers, ripening under ground, have become important foodstuffs in some parts of the world. Less nutritious than grain, they have the merit of being easily cultivated. The most important tubers are potatoes, sweet potatoes, manioc yams etc.

Root Vegetables: This is similar to starchy tubers in that they are root swellings and grow partially underground, such as carrots, turnips, swedes, parsnips, mangolds. All are essentially crops of the cool temperate lands. Root crops play an integral part in the crop rotation systems of modern scientific farming. Carrots and parsnips excepted, root crops are mainly grown as fodder crops.

Pulses: It is a general term for leguminous plants including peas, beans, soya beans, ground nuts, lentils, etc. Beans of which there are many varieties are widely grown as they flourish under a great range of climatic conditions. The soyabean forms a multi-purpose crop in the Far East and it is recently known to be cultivated on a large scale in the United States as a source of vegetable oil.

Green Vegetables: A variety of green vegetables, *e.g.* cabbage, cauli-flowers, brussel sprouts are grown as subsistence crops, often in garden and allotments as well as field crops.

Market Gardening: Many vegetables such as salad crops including lettuces and tomatoes are intensively cultivated on small specialised plots, known as market gardening or in North America as truck-farms. The emphasis here is on the commercial cultivation of carefully graded meticulously patched garden-crops which have a ready sale in urban areas where the people enjoy high-living standards.

Garlics are grown in areas which are favourably placed climatically, *e.g.* the Sicily Isles, the South Cornish Coast, the Channel Islands, Britain, Florida, Cuba; these are despatched by air to city markets where they command high prices (thus offsetting the extra cost of carriage) because of their 'out of season' availability.

Fruits

Fruits are grown as a small scale round farmsteads in most parts of the world. They provide the farmers an additional income. The introduction of cold storage, the speeding up of shipping services and rise in living standards have made a profound impact in raising the living standards of many countries, *e.g.* fruits like apples, oranges, bananas have entered much more widely in international trade.

The principal classes of fruits can be divided in the following:

(a) *Tropical fruits:* Bananas, pine apples, dates, coconuts, Brazil nuts.

(b) *Sub-tropical fruits;* citrus, figs, grapes, almonds, walnuts.

(c) *Temperate deciduous fruits:* Apples, pears, plums and other stone fruits and various 'soft' fruits.

Apples: These are the most important cool temperate fruits. It is widely grown in Europe, in the north-western and north-eastern parts of the United States and the adjoining parts of Canada, in

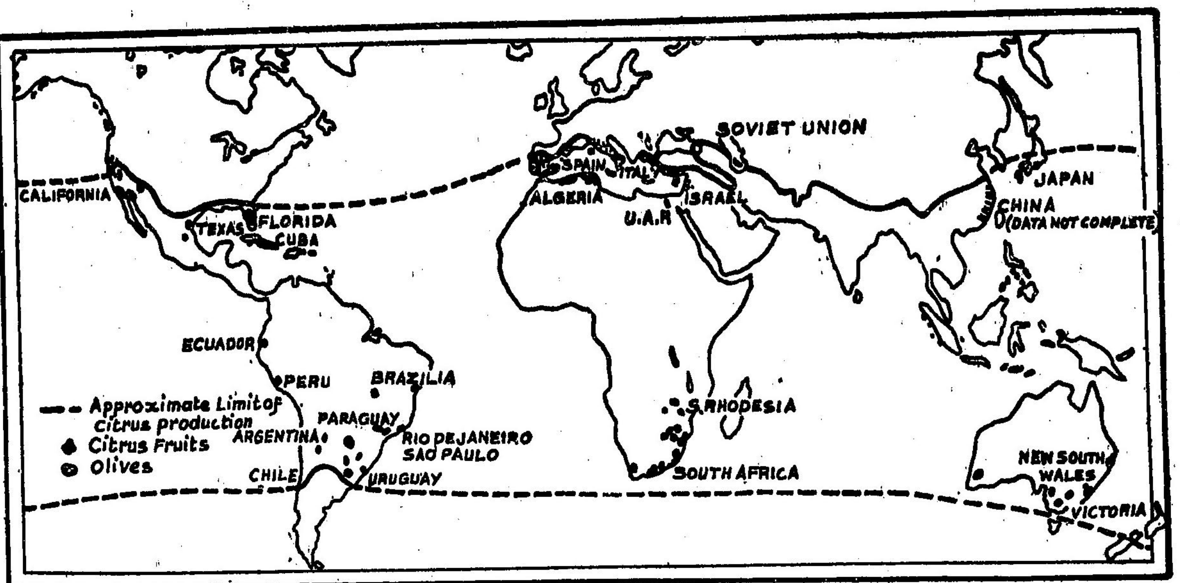


FIG. 3.6 Major Citrus and Olive Growing Regions

South-eastern Australia and New Zealand. In France, Germany and Britain a portion of the crop is converted into cider. Pears, a similar hard deciduous fruit, have a slightly wider range than apples, but both production and exports are much smaller.

Citrus Fruits: Oranges and lemons are the two of the citrus fruits, widely grown in lands having a mediterranean type of climates but oranges may also thrive in warm lands with wetter summers such as Florida, Southern Japan and South-eastern Brazil. Lemons are more restricted in their distribution coming mostly from Southern Italy and Sicily and Southern California. United States accounts 90% of the world's grape fruits, especially Florida and Texas: Other notable places of importance of fruit crops are West Indies, British Honduras and South Africa. Lime, cultivated mainly for lime juice, comes chiefly from the West Indies, *e.g.* Dominica (Fig. 3.6).

THE BEVERAGES

Tea

Tea is the dried leaf of a small evergreen shrub mainly grown with monsoon area of South-eastern Asia. There are several varieties of tea plant but the real distinction is between the Indian and Chinese types, the former possessing thin, relatively large leaves, which permit rapid transpiration and enable it to be cultivated under hot, humid conditions and the latter having small, thick leaves, which enable it to withstand a certain amount of cold and drought. Usually tea requires considerable warmth, plentiful moisture, a deep-fertile, well-drained soil and makes heavy demands upon labour. It is typically grown on hill slopes. Frequent pluckings are made throughout the year. The bushes are pruned to a height of about 4 feet to produce a flat 'top' to facilitate picking. The collected leaves are taken to the processing units on the estates or plantations where, withering, rolling, fermentation, drying, sorting and packing (in foil-lined chests to preserve the flavour and prevent deterioration in carriage) is undertaken.

The chief tea producing areas are Assam and the Nilgiri Hills in India, the hill country of Central Sri Lanka, Western Java, Central

and Southern China and Southern Japan. Plantations also occur in Uganda, Kenya, Tanzania, Malawi and Natal, Taiwan, Pakistan and the Soviet Union. India, Sri Lanka (Ceylon) and China are the three major producers (Fig. 3.7).

TABLE III

Production of Tea in 1976

Country	Production in '000 Tons
India	512
China	347
Sri Lanka	196
Japan	105
U.S.S.R.	87
Indonesia	70

Trade: The United Kingdom is the largest importer of Tea accounting nearly 50% of the total. United States, Australia, the U.S.S.R. and Canada are also some of the importers of tea. The important tea exporting countries are India, Sri Lanka, Indonesia, Kenya and Bangladesh. India also contributes 33% of the total value of all exports. India stands in the first place in the export of tea. Her export in 1976 amounted to 224 m. k.gms.

Sri Lanka is the second largest tea exporting country in the world which handles nearly 35% of the world's tea trade. Japan handles about 1% of the world's tea trade.

Coffee

The coffee plantations occur in tropical regions, usually on slopping land, where there are long, hot and moist seasons followed by a short, dry cool season and where frost is absent, and where the soils are rich and well drained.

The chief producing areas are as follows (Fig. 3.7):

(*a*) *South-eastern Brazil:* One third of the world's total output is produced in Brazil. Here coffee is cultivated on large

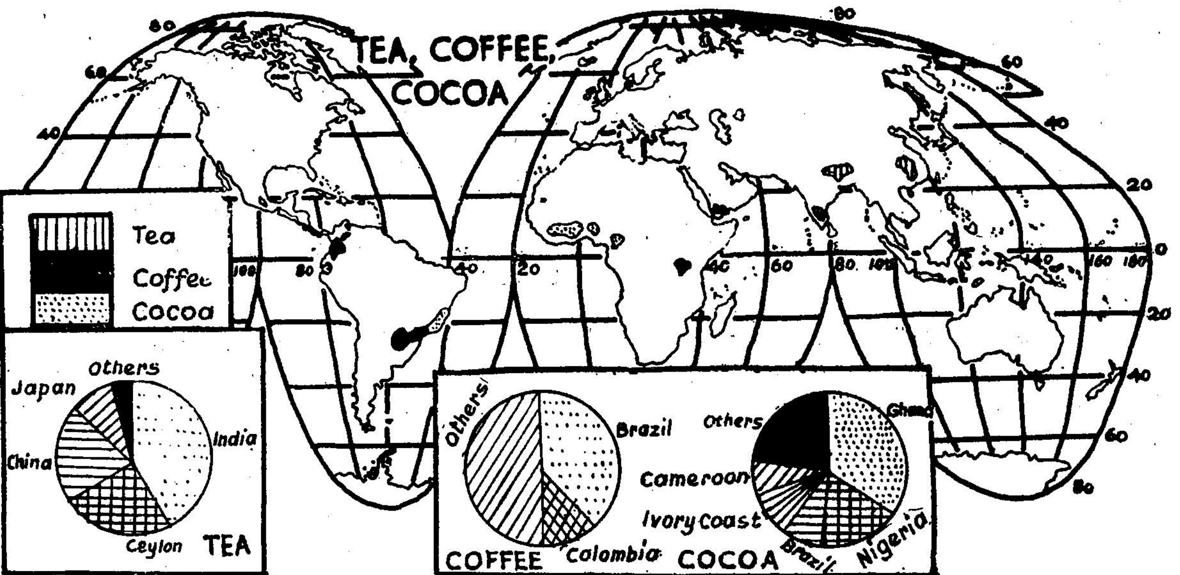

TEA, COFFEE, COCOA
Tea
Coffee
Cocoa
Others
Japan
China
India
Ceylon
TEA
Others
Brazil
Colombia
COFFEE
Others
Ghana
Cameroon
Ivory Coast
Brazil
Nigeria
COCOA
Distribution of the production of TEA, COFFEE and COCOA

FIG. 3.7

plantations or *fazenhas*, especially in the areas of tersa rosa soil, red earth rich in iron and potash which is derived from weathering igneous rocks.

(*b*) *The Hill Country of Colombia:* Coffee is found at an altitude of 6000 feet, where the smaller farmers specialise in the production of finer, milder variety known as Cafe Suave. About 1/10 of the world output is produced by Colombia.

(*c*) *The Republics of Central America* and some of the West Indian islands tend to specialise in coffee of a very high quality; the coffee is cultivated on the western slopes of the Cordillera and on the western sides of the hills in the islands where there is a dry season.

(*d*) *Africa:* Three countries in order of production are Ivory Coast, Angola and Uganda, which have a substantial output but the combined produce is only about 17% of the world total.

TABLE IV

Production of Coffee in 1976

Countries		Production in '000 Metric Tons
Colombia	...	510
Brazil	...	400
Ivory Coast	...	272
Mexico	...	252
Uganda	...	213
Guatimala	...	156
Angola	...	72

Trade: In the total production of coffee, about 70% enters the international market. Brazil accounts for about 35% of the total production followed by Colombia 20%. and Africa 20%. El-Salvador, Guatimala and Indonesia are the other important exporters of coffee. About 2.7 million metric tons of coffee was exported in 1975 to various countries. The chief importers are U.S.A., West Germany, France, Italy, U.K., Belgium and Sweden.

COCOA

The *Cocoa* tree is native to Latin America, but almost about two-thirds of the world's total production (over 1 million metric tons) of cocoa comes from the countries of West Africa, where it is mainly grown as a crop on peasant farms. Latin America (Brazil, Ecuador, Venezuela, Dominican Reublic) produces most of the rest.

The cocoa tree is essentially an equatorial plant requiring uniformly high (80°F. 27°C) temperatures, an abundant and evenly distributed rainfall, deep, rich moist but not saturated soils and shelter from direct sunlight and strong winds. Optimum conditions are usually found in equatorial coastal lowlands which are a little moved from the littoral.

The fruit, borne on the trunk and main branches, consists of large, oval-shaped, purplish pods from which the individual beans, encased in pulp, have to be extracted and dried before being bagged for export. The beans are processed in the importing countries such as the United Kingdom, the countries of Western Europe and the United States (Fig. 3.7).

RUBBER

The discovery of the vulcanisation process (1840), the invention by Dunlop in 1890 of the pneumatic type and the invention of the other motor car shortly before 1900 have made a profound impact in the realisation of the tremendous growth in the world's output of rubber. Most of the rubber which is produced goes into the making of vehicle tyres, but rubber finds many other uses, *e.g.*, as insulating material, floor coverings, hose-pipes, footwear, etc.

Half of the world's supply of rubber consists of natural rubber which is obtained from the latex exuded by a number of equatorial forest trees, the most important of which is the Hevea brasiliensis, a native of the Amazon Basin. The other half of the world's supply is obtained synthetically; synthetic rubber is made by the chemical treatment of petroleum, coal and limestone.

Conditions of Growth

The principal requirements for the growth of rubber tree are those characteristics of equatorial low land areas.

(*a*) *High Temperatures* averaging 80°F (27°C) and not falling below 70°F (21°C).

(*b*) *Heavy Rainfall* atleast 150 c.ms. evenly distributed throughout the year.

(*c*) *Undulating land or gentle hill slopes* allowing good drainage.

A rich, deep soil is desirable but the rubber tree will grow on a variety of soils. Another essential requirement is the availability of cheap and reliable labour. In Malaysia, where there was a labour problem, Indians had to be imported to man the plantations.

Malaysia is the world's greatest producer of natural rubber, accounting for one-third of the total production. The rubber growing areas are mostly located along the western coast lands between sea level and the 250 metre contour. Some 3½ million acres

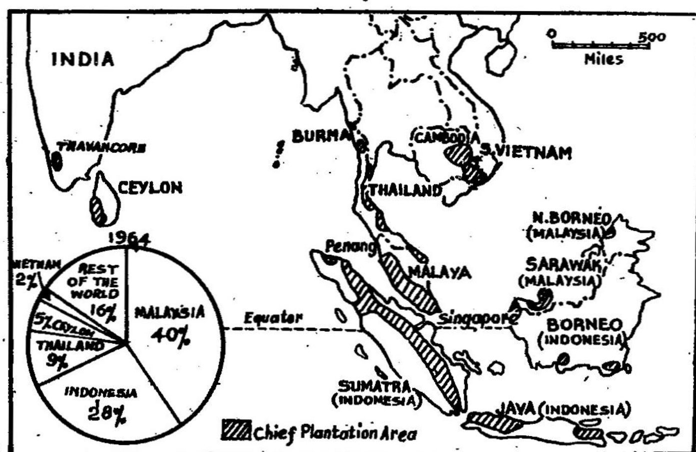


FIG. 3.8 Rubber Plantations in South-east Asia

are planted to rubber. The trees grow on a variety of soils; in clays and alluvium and in quartzite and stale soils. Only the peaty soils are avoided. More recently newer plantations have been established on the eastern side of the Peninsula, but the only really important area so far is in the north-east in Kelantan. Some 500,000 Indians are employed in the rubber estates.

Production and Trade in Rubber

TABLE V

Natural Rubber Production, 1976

Country		Production in '000 metric tons.
Malaysia	...	1590
Indonesia	...	145
Thailand	...	400
Sri Lanka	...	150
India	...	145
Liberia	...	86

The principal producers are the countries of South-east Asia (particularly Malaysia and Indonesia). The leading importers are the United States, accounting for about 40% of the total production, the United Kingdom about 13%, West Germany about 8% and France about 7%.

Synthetic Rubber

The synthetic rubber was first produced in Germany during the First World War. In 1940, synthetic rubber accounted 8% of the total world production. The U.S.A. tops the list in the production of synthetic rubber. The world consumption of rubber in 1976 accounts to 3.5 million tons of natural rubber and 6.3 million tons of synthetic rubber. The notable producers of synthetic rubber are U.K., Japan, Canada, Poland and the U.S.S.R.

TABLE VI

Synthetic Rubber Production, 1973—74

Country		Production in '000 m. tons.	Country		Production in '000 m. tons.
U.S.A.	...	2627	Italy	...	320
Japan	...	967	Brazil	...	125
France	...	447	U.S.S.R.	...	105
U.K.	...	354	India	...	21
W. Germany	...	349	Canada	...	229

TOBACCO

The different species of the tobacco plant are all native to the Americas. Tobacco is grown in many countries, both tropical and temperate. But it thrives best under sub-tropical conditions. The increasing nature of habit of smoking has realigned its increasing nature of the consumption.

The most favourable conditions for tobacco plants are fairly constant temperatures of 70°–80°F (21°–27°C), absence of frost, regular water supply, a humid atmosphere and well-drained soils which are rich in plant foods.

The flavour and quality of tobacco depends upon the plant type, the climatic conditions under which it is grown, the soil and the processing of the leaf.

The principal producing areas are:

(*a*) *The United States* dominates world production and is also the greatest exporter, accounting for over 75% of all tobacco entering world trade. The state of Virginia specialises in cigarette tobaccos, Kentucky in cigar tobaccos. It is an economic crop for the small farmer. The United Kingdom takes about half of the United States' export.

(*b*) *Europe:* Tobacco is widely grown in Europe and Bulgaria, Greece and Turkey are the main growers. Greece grows 'Turkish' tobacco from which 'Turkish' cigarettes are made.

(*c*) *Africa:* Tobacco growing has become an important activity in Rhodesia, Zambia, and Malawi where the sandy soils, warm summers (around 70°–75°F) and cheap Negro labour favour production.

(*d*) The other countries notably include China, India, Japan, Brazil and the Soviet Union. They grow large amounts of tobacco, but most of it is consumed internally.

SUGAR-CANE

Sugar-cane

Sugar is obtained from sugar-cane and sugar beet which account 67% and 33% respectively in total production. Sugar is derived from some roots of the plants, like beets, carrots etc. Apart from these it is also derived from dates, maples, sorghum, palm trees etc., but of very negligible quantity. Three main sources of sugar are:

(a) *Trees* such as the sugar-maple, the date-palm and several other palms, but these form the least important source.

(b) *Sugar-cane*, a tall, tropical, thick stemmed perennial grass is cultivated mainly on plantations by monocultural methods.

(c) *Sugar-beet*, a root plant, belonging to the beet family, is grown in cool temperate lands.

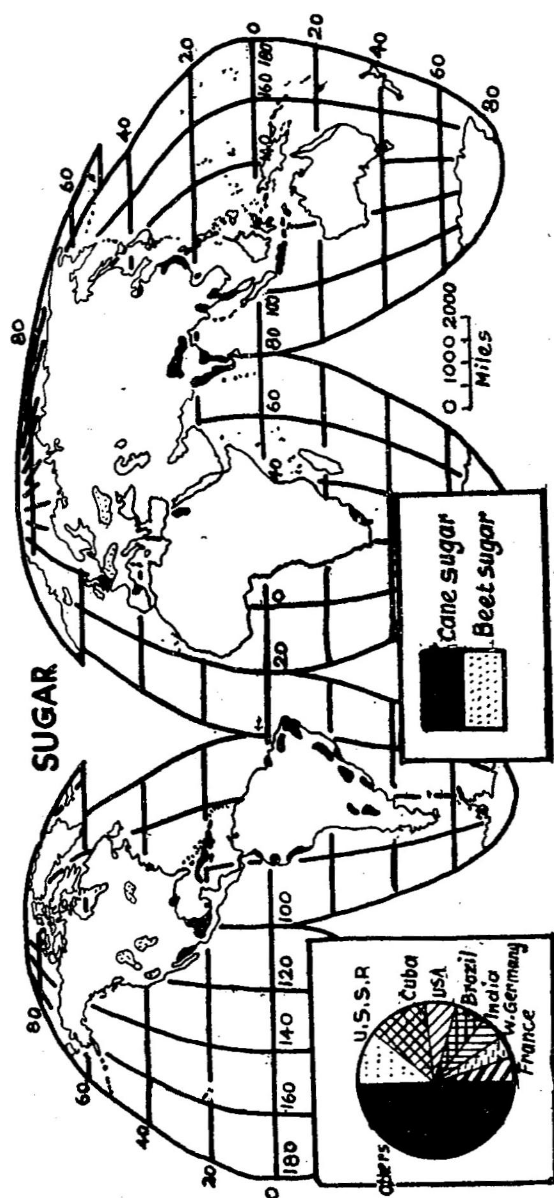
The vast bulk of the world's sugar supply comes from cane (about 3/5 ths.) and beet (2/5 ths.). Cane provides some 95% of the total exportable supplies. Molasses and rum are by-products of cane-sugar production.

The conditions required for sugar-cane cultivation are:

1.	Temperature	...	70°–80°F (21°–27°C).
2.	Rainfall	...	Minimum of about 120 cms. unless irrigated.
3.	Soil	...	Deep, fertile, well-drained soil.
4.	Labour	...	Abundant cheap labour necessary.

The conditions required for sugar-beet are as follows:

1.	Temperature	...	60°–73°F (16°–23°C).
2.	Rainfall	...	About 60 cms. mainly during the growing period.
3.	Soil	...	Well drained, fertile, loamy, stone-free soil.
4.	Labour	...	Makes fairly heavy demands on labour.



Distribution of the production of cane sugar and Beet sugar

FIG. 3.9

TABLE VII

World Production

Sugar-cane Production—1976

Country		Production (in Million Metric Tons)
India	...	140.1
Brazil	...	89.9
Cuba	...	53.5
China	...	42.1
Philippines	...	24.6
Australia	...	22.1

The principal cane-producing regions are the West Indies (especially Cuba), Indonesia (especially Java), India, the Philippines, Taiwan and Southern China. Other notable areas are the tropical coast lands of Queensland, Mauritius, Hawaii, Natal, the Gulf coast of the United States and Brazil. The world's leading exporter of cane-sugar is Cuba. Australia, Philippines, Brazil, India, Taiwan are the other exporters. The principal importers are the U.S.A., Japan, the U.S.S.R. and the other European countries. (Fig. 3.9).

TABLE VIII

Sugar-beet Production—1975

Country		Production (in Million Metric Tons)
U.S.S.R.	...	66.2
U.S.A.	...	26.5
France	...	22.8
Poland	...	15.3
West Germany	...	6.5

Nearly 55% of the world's production of beet-sugar comes from Europe. The U.S.S.R., Germany, France, Czechoslovakia, and Poland are the important producers of sugar-beet. The U.S.S.R. is the leading producer of sugar-beet, which amounts to 50% of the total world's cultivated land of this crop. Trans Caucasia, West Siberia, South and Central European Russia, Kazakh, Kirghiz are the important areas. World's 1/3 of the production of Sugar-beet comes from these areas.

Trade: The beet-sugar is utilised in all the beet-sugar producing countries excepting the Czechoslovakia and to a smaller extent in Poland and Hungary.

INDUSTRIAL FIBRES

Animal and vegetable food-stuffs sometimes can be used for industrial uses, and of which many commodities are grown to meet the requirements of some manufacturing processes. Textiles may be of vegetable, animal or chemical origin but the vegetable fibres are the most important of all the different kinds of fibres used in textile manufacture. The use of a particular commodity may change due to the finding or the invention of a substitute and changes in fashion or usefulness. New uses may be found for commodities and this may lead to greatly increased production. The chief industrial raw materials (excepting minerals) are: fibres, vegetable oils, tobacco, rubber, hides and skins, bone and horn and timber along with various other forest products.

Cotton

Cotton is a fibre, derived from the bolls (opened seed pads) of a tropical or sub-tropical perennial shrub generally known as an annual. Cotton is primarily a cash crop. There are numerous varieties and the occurrence of each specific variety depends upon the suitability of particular conditions. The quality of cotton is largely determined by the length of the fibre, but other qualities such as fineness and lustre are taken into consideration. The cotton can be classified into two main types: short-stapled cotton and long-stapled cotton.

Ideal conditions required for cotton production are:

(*a*) *Equable, warm conditions* in the growing period with temperature reaching 77°F (25°C) in summer.

(*b*) *A minimum growing period* of atleast 200 frost-free days since cotton is killed by frost.

(*c*) 60–10 *cms. of rain* during the growing period or the equivalent supply of water by irrigation.

(*d*) *Dry, sunny conditions* during the maturing period since rain at this time is apt to spoil the bolls.

(*e*) *A deep, rich, well drained soil* but one with a high moisture-holding capacity.

(*f*) *A large supply of labour* to meet the heavy demands of ploughing, sowing, weeding and picking.

The chief producing areas are U.S.S.R., U.S.A., China, India, Brazil and Egypt. The countries that come next in importance are Mexico, Turkey, Sudan, Peru, Uganda, Pakistan etc. (Fig. 3.10).

The U.S.S.R. is the foremost producer of cotton followed by U.S.A. The United States accounts nearly a quarter of the total world production of cotton. Most of it comes from the cotton belt in 'the South' where the cotton is of medium grade. Higher grade cotton is produced under irrigation in the areas like California and Texas.

TABLE IX

Cotton Production—1976

Country		Production in Million Tons.	Percentage of the World Total
U.S.S.R.	...	2.7	21.9
China	...	2.4	18.9
U.S.A.	...	2.1	17.0
India	...	1.1	9.2
Turkey	...	0.57	4.5
Pakistan	...	0.55	4.3
Brazil	...	0.4	3.0
Egypt	...	0.3	2.6

The principal exporters of cotton are U.S.A., Egypt, Pakistan, Brazil, Uganda, Peru and the U.S.S.R.

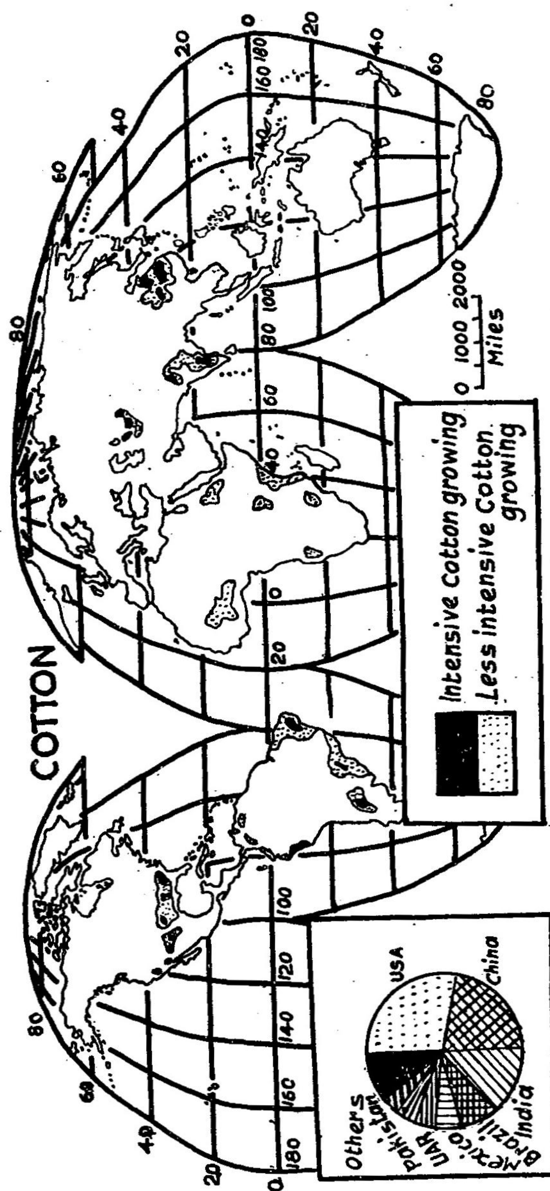

COTTON
Intensive Cotton growing
Less intensive Cotton growing
0 1000 2000
Miles
USA
China
India
Brazil
Mexico
UAR
Pakistan
Others
Distribution of the Production of Cotton_1967

FIG. 3.10

TABLE X

Major Exporters of Cotton—1975

Country		Export in '000 Met. Tons.
U.S.A.	...	871
Pakistan	...	205
Egypt	...	185
Mexico	...	151
Brazil	...	107

The largest importer of raw cotton in the world is Japan. U.K. imports cotton regularly from U.S.A. India imports long staple cotton from U.S.A., Kenya, U.A.R., Tanganyika and Sudan amounting to 96 thousand metric tons annually.

Jute

Jute is a tropical crop, requiring high temperature and heavy rainfall. A damp and hot climate with a temperature of not less than 27°C and with more than 150 cm. of rainfall is the ideal condition for the growth of this crop. Alluvial soil of the *flood* plains is best suited to this crop. The best quality of the fibre is obtained from loamy soil and high yield comes from clayey soil. Manuring is essential.

The whole of world's supply (75%) of jute comes from the Ganges-Brahmaputra delta, shared between India and Bangladesh. Thailand and Brazil also produce small amounts. It is exported from Calcutta in India, Chittagong and other Bangladesh ports, to Dundee in Scotland, and to West Germany, France and Belgium. Some of the largest jute mills in the world are located in Calcutta and other neighbouring cities. Jute is the fibre used in the manufacture of packing meterials in India called 'sack' or 'gunny-cloth'. It is 'the brown paper of the wholesale trade' and is used as the foundation of carpets and linoleum and in the making of upholstery and twine.

Trade: Bangaladesh is the leading exporter of raw jute. About 60% of the raw jute production is mainly used for export to western Europe and 25% enters India. India exports her jute goods all over the world. The chief importers of jute are U.S.A., West Germany, Japan, Italy and Belgium.

Sericulture

Silk is produced from the cocoons of silk-worms. The cocoons, when unwound, produce a lustrous gossamer-like fibre. The rearing of silk-worm and the production of raw silk is almost entirely a domestic industry mainly undertaken by the wives of peasant farmers. This is particular in the case of China and Japan which form the major producers of silk. The Soviet Union ranks third in raw silk production.

The cultivation of the silk-worm is possible wherever the mulberry tree will grow, but in practice sericulture is confined to sub-tropical and 'Mediterranean' regions. The caterpillar itself cannot stand temperatures lower than 16°C (60°F): There are several species of silk spinning moths of which the *Bombyx mari* is the most important.

The total world output of raw-silk is small, amounting to 30,000 metric tons. The following table accounts the chief producers.

TABLE XI

Raw Silk Production (Metric Tons)

Countries			1960	1970
Japan	...		18,048	20,515
China	...	(1959)	6,225	10,200
U.S.S.R.	...		2,358	3,024
S. Korea	...		500	2,846
India	...		1,154	2,250
Italy	...		892	850

The silk is mainly produced in two areas:

1. *Monsoon Asia,* supplies about 90% of the total output, where Japan is the dominant producer.

2. *The Middle East and the Mediterranean Countries,* where Italy is the only significant producer. The world production of silk is less than a third of what it was in pre-war days and output has declined everywhere except in Italy and the Soviet Union.

Japan, China and Italy are the chief exporters, with 62%, 66% and 8% respectively of the total world export trade. The United States is the largest importer, absorbing about 45% of the silk entering into international trade. She takes about 2/3rds of the Japanese export and about half of the Italian export. France is the second largest importer accounting for about 16% of the import trade.

CHAPTER IV

BIOTIC RESOURCES

Biosphere has provided man with various resources in the form of Flora and Fauna on the surface of the earth. Unlike other resources all the Biotic resources are utilised by mankind since longtime and are renewable. Scientific exploitation will conserve these resources to be made available for a longer period.

NATURAL VEGETATION

Natural vegetation is one of the important resources, the Earth has in abundance. Most of the earth's surface is covered by one or other type of natural vegetation. The type of natural vegetation of a particular region varies according to several factors. The factors like temperature, rainfall, soil, duration of sunlight, altitude, slope etc. determine the nature and extent of natural vegetation.

Factors Affecting the Growth of Natural Vegetation

Factors controlling the distribution of plant cover on the surface of the earth are as follows:

1. *Temperature:* Temperature is one of the important factors affecting the plant growth. Temperature permits the various chemical changes in the body of the plant to take place and thus helps its growth. Whenever the temperatures are very low, the plant growth stops and the plant is at 'rest' until higher temperature occurs again. Due to cold conditions prevailing in the polar regions, they are deprived of any plant cover.

2. *Rainfall:* Next in importance to temperature is the amount and the seasonal distribution of rainfall. The rainfall determines the nature and extent of natural vegetation in the areas where the same temperature conditions prevail. Forests are found in the areas of heavier rainfall and scanty vegetation of zerophytic type in the areas of low rainfall and scrubland and

grasslands in the areas of intermediate rainfall. No plant can grow without sufficient moisture. Moisture is necessary for plant growth to circulate its food in solution throughout its body and for transpiration to withstand the excessive temperature conditions.

3. *Soils:* Plants derive their nutrients from the soil to which they are rooted. The effectiveness of precipstation and moisture supply to the roots are largely determined by the texture of the soil. A clay soil is too stiff to allow the water to percolate as well as the roots to develop whereas in the sandy soils can easily develop downwards but the water holding capacity of sandy soils is very low as they are porous. A mixture of these two, loamy soil is ideal for plant growth.

4. *Duration of sunlight:* Duration of sunlight is an important factor determining the plant growth as the plants require sunlight for photosynthesis. If deprived of sunlight, the plant leaves become yellow and subsequently the plant dies. In spite of the long cold winter, the vegetation in the higher middle latitude are able to survive mainly because of the availability of sunlight for long hours during the summer.

5. *Altitude:* As the temperature decreases gradually from lower to higher altitudes, the nature of vegetation also differs from lower to higher altitudes. In the mountains of the Tropics, the vegetation gradually changes from that of tropical in the lower elevation to temperate type of vegetation in the higher elevations. Beyond certain altitude, they are free from any plant growth like polar regions as the prevailing temperature is very low. Hence the altitude determines the vertical distribution of natural vegetation.

Types of Natural Vegetation

The natural vegetation of the earth can be grouped under three types. They are:

1. Forests.
2. Grasslands.
3. Desert Vegetation.



Types of Natural Vegetation.

FIG. 4.1

Forests

Association of plants, predominantly trees are known as forests. Forests can grow in areas of abundant rainfall. They can also maintain themselves even in the areas of moderate rainfall provided the distribution is fairly uniform throughout the year. The amount of transpiration and the nature of soil determine the extent of forests as they affect the moisture availability to the plants.

Uses of forests: Forests are useful in many ways. Man gets innumerable materials to satisfy his needs such as food, fuel, fibre, timber, drugs, paper, spices, rubber etc. Forests prevent soil erosion. They maintain the fertility of the soil with the decomposed leaves fallen on the ground. Forests provide shelter to wild animals. Morever human existence is facilitated by forests as they absorb carbon-di-oxide and release oxygen.

Types of forests: Forests can be broadly classified into two groups:

1. Tropical Forests:

   (*a*) Selva or Wet Equatorial Forests.
   (*b*) Monsoonal Forests.
   (*c*) Tropical Tidal Forests—Mangrove Forests.

2. Mid-latitude or Temperate Forests:

   (*a*) Temperate Deciduous Forests.
   (*b*) Mediterranean Forests.
   (*c*) Taiga or Coniferous Forests.

Distribution of Forest Types

Of the total area covered by forests, Europe including Soviet Union and North America contains about 40%; Latin America and Africa has 23 percent and 21 percent respectively. The remaining 16 percent is in Asia and other pacific countries. Of the total forested area, one third of the area is covered by conifers alone and the remaining is shared by broad leaved forests or Tropical and Temperate deciduous forests.

TABLE I

The Regional Distribution of World's Forests—1963

(in Million Hectares)

Continent/Region		Forested Area	Percent of Forest to Total World Forested Area	Percent of Forest Cover to Total Land Area of the Continent
Europe	...	136	3.5	28.3
Soviet Union	...	743	19.4	33.9
North America	...	656	17.1	36.1
Latin America	...	890	23.2	39.7
Africa	...	801	20.9	27.0
Asia	...	525	13.7	19.8
Oceania	...	86	2.2	10.0
World Total	...	3837	100.0	29.1

I. Tropical Forests

(*a*) *Selvas or Wet Equatorial Forests:* Selvas or Wet Equatorial forests are found between 5°N and 5°S of the Equator. These areas receive very heavy rainfall with high temperatures ranging from 24°C to 30°C. The variation of temperature is very low. The rainfall varies from 175 cm. to 300 cm. annually. There is not a single rainless month. The high temperatures with abundant sunshine, copious rainfall and high humidity promote the vegetative growth throughout the year. The resultant forest is deep and dense. Broad leaved evergreen hardwood forests are common. These forests contain trees of different species, all mixed up having no pure stands. For instance, atleast 16 different trees will be found in a 0.4 hectare area. These forests contain valuable trees like mahogany, ebony, palm, rosewood, cedar, rubber etc. and are mostly found in South and Central America, South-eastern Asia and the East Indies.

(*b*) *Monsoonal Forests:* In certain areas of the world between 5° to 30° North and South, the climate is characterised by comparatively high temperatures throughout the year with a distinctive

dry season. The rainfall is moderate to heavy and is completely absent for a couple of months. In these monsoon lands, free growth is arrested during the dry season due to scarcity of water. Trees shed their leaves during this period to avoid transpiration. Hence they are also known as Monsoonal Deciduous forests. These forests cover the central and north-eastern parts of India, Bangladesh, Burma and Indo China. The more common species include sal, teak, ebony, sandalwood and bamboo. Rubber, bamboo, mahogany, ebony are found in areas with annual rainfall of more than 200 cm. Sal, Teak, Iaurrel and Mulberry trees are usually found in areas receiving 100–200 cm. of annual rainfall.

(*c*) *Mangrove Forests:* These forests are found in the Tropical areas affected by tidal currents. Sundarbans in India is one of the extensive Mangrove Forests.

II. Mid-latitude or Temperate Forests

(*a*) *Temperate Deciduous Forests:* The temperate deciduous forests are found in two areas in the northern hemisphere: (i) East of the dry interior roughly between latitudes of 40° and 60° of the U.S.A. and (ii) Western Europe. In the southern hemisphere these forests extend from about latitude 20° on the east coast and 40° on the west coast to the extreme south. They are almost absent in Africa and Australia as the greatest stretch of these two continents is in the Tropics.

These forests are the result of distinctive summer and winter seasons of the temperate belt. The deciduous trees, found in these regions shed their leaves during the winter. Slow tree growth, short stature and the formation of great quantities of wood as reservoirs of plant food for the resting season are some of the characteristics of deciduous forests. These forests contain hard-wood trees like oak, birch, ash, chestnut, maple, elm, and walnut. Here and there especially in the hilly regions deciduous forests are found mixed with coniferous trees. Hence they are known as Mixed Deciduous Forests. The temperate deciduous forests are found in the north-eastern parts of U.S.A., Siberia, the Alps and Pyrenees, Manchuria, Korea, Japan, China, Patagonia and Southern Chile.

(*b*) *Mediterranean Forests:* These forests are found in areas where Mediterranean climate prevails. These areas are charac-

terised by dry summer with an average temperature of 20°-26°C and with an annual rainfall of 25-100 cms. The rainfall occurs mostly during the winter months. These forests consist of unique broad leaved evergreen dwarf trees with long roots and thick barks to withstand the severe dry summer season.

In order to prevent the excessive transpiration, the leaves of these trees are covered by a wax like substance. The important species of this type are oak, chestnut, cedar, walnut, laurrel, olive and maple. Corks from the barks of oak, nuts, olive oil and various fruits are obtained from the forests. The hardwood timber is used for ship building and for making furniture. Spain, Portugal, Algeria and Tunis are the important nations with this type of forests.

(*c*) *Coniferous Forests:* Coniferous forests are found in the poleward regions between 50°-70° N. where long cold season is prevailing and in the higher altitudes in the lower latitudes where the climatic conditions are comparable to that of higher latitudes. These forests are also known as Taiga or Boreal Forests in Soviet Union. The trees of coniferous forests thrive well in the porous, dry, sandy soils. They are found in the areas of higher middle latitudes where summers are moist with temperature averages less than 15°C and the winters are so cold that the soil remains covered by snow for many months. The everlasting, small needle shaped leaves of the conifers are best adapted and have the capacity to withstand the cold winter and protect from the dry winds to avoid excessive transpiration.

The conifers extend almost uninterruptedly over North America and Eurasia. The principal coniferous forest regions are Soviet Union, Canada, the U.S.A. and the Sienas of Mexico, northern and central Europe, Manchuria and parts of Japan, New Zealand and south-eastern states of Brazil, Argentina and Chile. These forests consist of softwood trees chiefly of pure stands namely pines, firs, spruces and cypress.

Grasslands

When the availability of moisture is limited, the resultant natural vegetation will be grasses. The grasslands represent the transition zone found between forested areas which receive heavy rain-

fall and desert lands with scanty vegetation as a result of meagre rainfall. There are three chief types of grasslands. They are (i) Steppes; (ii) Prairies in the middle latitudes and (iii) Savanna in the low latitudes. The middle latitude grasslands are well developed to be termed as 'Granaries of the World'.

(*i*) *Steppes:* The Steppes are grasslands found in the cool semi arid regions. They are covered by a continuous mat of grasses which are at maturity only a few cm. in height. In these areas, the water is absorbed only by the surface layers and underneath them the layers are permanently dry. Hence the availability of moisture is limited to the surface layers. They promote only shallow rooted grasses on the surface. The largest steppes are found in Eurasia extending from the Baltic sea eastward beyond Lake Balkash including the Great Kirghiz steppes. Two small areas occur in the Far East, one in Manchuria and the other in Ordos desert.

(ii) *Prairies:* Unlike the Steppes, the prairies have tall, deep rooted grasses. Since the soil moisture is available upto as much as half a metre, the grass is about 3 metres tall. The boundaries of these grasslands are abruptly marked by forests. The most important extensive areas of Prairies are found in North America and South America (where they are known as Pampas).

(*iii*) *Savanna Grasslands:* Essentially these grasslands are found between deserts and forests in the Tropics. The Savanna vegetation includes scattered trees and low bushes and thus distinct from the prairies or steppes where trees occur only along streams. Hence the grass area is limited in the Savanna; they are not so useful for grazing.

The Savannas include the Parkland of Africa (Sudan, East African Highlands, and around Kalahari as far south as Natal). They also occupy the areas in Venezuela, Brazil and Australia as well as the drier parts of Central America and East Indies.

Desert Vegetation

There are two kinds of deserts in the world. They are cold deserts in the polar regions and hot deserts in the tropical regions. Both of them have very scanty vegetation. In the hot deserts, due

to scarcity of moisture and scorching winds and in the cold deserts or Tundra regions for want of sufficient heat and cold winds, tree growth is prevented. Zerophytic varieties such as cactus and bulbous vegetation is typical of hot deserts while in the cold deserts mosses and lichens are the prevailing type.

Lumbering

Lumbering is one of the important activities of man to obtain timber and wood pulp from the forests. It is carried on in many parts of the world. The development of lumbering depends upon several factors such as nature of forests, the relief, accessibility, availability of cheap power, etc. Lumbering has well developed in the temperate zone especially in the coniferous regions. This can be easily understood from the fact that the conifers satisfy nearly 80 percent of the timber needs of the world.

The development of lumbering in the coniferous forests of the Temperate Zone are due to several reasons namely:

(1) Coniferous forests cover vast areas with species of pure stands, *i.e.* a vast area of coniferous forest will contain a single tree namely pine or fir.

(2) High accessibility: Transportation and communication lines have well developed in this region. Moreover these forests contain soft wood trees and they can be easily transported by numerous perennial rivers of this region.

(3) Availability of cheap hydro-electricity power.

(4) Technological advancement of this region has resulted in the mechanization of lumbering.

Important Timber Producing Regions

1. *Soviet Union:* One third of the land area in Soviet Union is covered by forests. The forests show a gradual change from Taiga or conifers in the north to a mixed forest and then to deciduous forests in the south. Lumbering is developed only in the European part of the country. In the Asiatic side, since most of

the rivers flowing northward and they are frozen for several months lumbering has not developed. Soviet Unión is the leading producer of timber and wood-pulp.

2. *U.S.A.:* U.S.A. is only second to Soviet Union in the production of timber and wood-pulp. Pacific coast, Southern U.S.A., Rocky Mountains, Appalachian Mountains and New England States are the important timber producing regions of U.S.A. Pacific coast contains valuable soft woods such as Douglas fir which grows to a height of 80 metres and to a thickness of 6 metres. Pine, yellow pine, spruce and larch are the other varieties obtained from the other regions.

3. *Canada:* A vast area from the Rockies to eastern Newfoundland and Nova Scotia is an important source of timber supply. Quebec, Ontario, British Columbia are the largest timber producing provinces and New Brunswick and Nova Scotia have considerable importance. Spruce, balsam fir, douglas fir, temlock and white and red pines are the principal trees cut. Usually in the autumn, felling of trees is done. The snow on the surface helps to remove the logs with the help of tractors to the frozen streams or lakes. In the beginning of the spring when the snow melts, the logs are moved down streams.

4. *North European Countries:* Norway, Sweden and Finland are the important timber producing countries of North Europe. Of the total land area Sweden has 50% forested land; Norway 25% and Finland 80%. Hence forests play an important role in the economy of these countries.

The forests are well managed. Afforestration, conservation and scientific forest management have increased their output. Availability of cheap power and scarcity of agricultural land have stimulated the development of lumbering in these countries.

Lumbering in the Tropics

Lumbering has not developed in the Tropics when compared to the Temperate forests. This is mainly because,

(1) Tropical forests contain too many species of trees and are impenetrable *i.e.* have dense undergrowth.

(2) Unfavourable climate with high temperature and high rainfall makes the labour exhausted.

(3) Lack of transport facilities and also they are far away from densely populated areas.

In spite of these drawbacks, lumbering is carried on in the Tropical forests by selective cutting of valuable trees. Timber is mostly obtained from Mahogany, Cedar, Teak, Ebony and Sandalwood trees. Various forest products are gathered from the tropical forests like natural rubber, spices, nuts, gums, resins, tanning materials, drug, etc.

Conservation of Forests

Forests are very essential for the existence of life in the earth. Continuous cutting of forests has created several environmental problems in the form of soil erosion, frequent flooding, decrease of rainfall etc. Of late several countries in the world have taken conservative measures to protect the forests from complete destruction. Afforestration and scientific management of forests are the remedies to preserve the forests.

WILDLIFE

There are several animal species found in the forests and other wilderness in their natural captivity. These are termed as wildlife. For many millions of years wildlife population were regulated by nature. After his appearance, man has gradually emerged as a formidable predator and is responsible for the extinction of several species.

With the introduction of Agriculture about 10,000 years ago man slowly began to displace the original wildlife population from extensive areas to isolated pockets. From 19th century onwards, due to sudden increase of human population man has become a major unbalancing influence. His activities such as construction of railroads, highways, the introduction of domestic animals into vast new territories, the cutting of forests and the ploughing up of grasslands for growing crops,—all these factors greatly modified or reduced the animals' natural habitat. But more important was

the great increase in hunting animals for their meat, skin, etc. has abruptly reduced their numbers to face extinction. The extinction or near extinction has given rise to ecological problems. Hence it is necessary to protect the precious wildlife for the existence of life in this earth.

Wildlife Conservation

At last, several voluntary agencies and governments have taken several steps to preserve the wildlife population. Wildlife refuges ranging from small areas for the protection of birds to vast parks and reserves have been created in all countries. The conservation of wildlife includes preserving and improving natural habitats, managing natural stock and restocking by artificial means.

The growth of tourism in the 20th century created a new value for wildlife by attracting people to witness the animals in their natural habitats. And to biogeographers the study of wildlife in their natural environment is of immeasurable value.

LIVESTOCK

The domestication of animals has brought a revolution in the human civilization. It is very difficult to think of a human civilization without the contribution of animals. Animals are useful in many ways. They provide man with food, clothing and other raw materials. In the developing countries of southern and eastern Asia they are used as draught animals. In the drier parts of the world they form the only available means of transportation.

Distribution of livestock is very uneven in the world. The greatest concentration of animals are found in the agricultural zones where animate energy is the backbone of agriculture as in the case of Far East; areas where intensive dairy farming is practised as in North-eastern U.S.A. and North-western Europe; in the temperate grasslands where grazing of animals to supply the beef markets of the world as in Argentina and western U.S.A. and in the arid and semi arid zones where other food sources and other means of transportation are not available as in Middle East.

Factors affecting the distribution of livestock in the world:

1. High density of population.
2. Standard of living.
3. Availability of extensive grasslands.
4. Technological advancement.

TABLE II

Distribution of Livestock (1975)

(in Million Heads)

Countries		Cattle	Sheep	Pigs
U.S.A.	...	131.8	14.5	55.1
Canada	...	15.3	0.7	5.3
Argentina	...	58.0	29.0	5.5
Brazil	...	92.6	26.5	35.0
China	...	63.5	73.3	242.0
India	...	180.3	40.0	7.1
Australia	...	33.1	153.0	2.3
New Zealand	...	9.8	56.0	0.5
Soviet Union	...	109.0	145.0	72.3
France	...	24.7	10.4	12.0
West Germany	...	14.4	1.0	20.2
U.K.	...	14.6	28.3	7.3
Denmark	...	3.0	0.05	7.8
Netherland	...	3.0	0.8	7.8

CATTLE

Cattle is raised both for beef and milk. More than one third of the cattle in the world is in Asia. South America has about 17 per cent of the cattles; North America 14 per cent; Africa 12 per cent; Europe 11 per cent and Oceania 2.2 per cent; India has the maximum number of cattle in the world, 170 million. But most of the cattle population is kept useless as the Hindu religion prohibits the cow slaughter.



Fig. 4.2 Cattle Regions

Beef Cattle

Beef cattle is found numerously in the extensive temperate grasslands. Cattle ranching for beef is predominantly practised in these areas because either rainfall is too low to raise crops or crops alone cannot be profitable. The productivity of these lands is very low as it requires 4 hectares of land per head of cattle. Hence land holdings are very high ranging from 1,000 to 40,000 hectares. Cattles are reared in these grasslands and then sent to important meat packing centres for fattening before slaughtering. The introduction of refrigeration facilities since 1880 has made Argentina and Australia to become the leading exporters of beef in the world.

Important Countries

U.S.A: U.S.A. second in actual number of cattles, is the leading producer of beef in the world. Concentration of beef cattle is found in three regions (1) Western U.S.A., (2) Corn Belt and (3) Southern U.S.A. In the west due to poor rainfall cattle rearing is the only alternative. In the corn belt, cattle raising forms an integrated part of agriculture. Cattles are fed with corn to raise the value of the agricultural output since corn is a low value bulk commodity. Beef represents 'corn in beef.' In the southern states, due to decline in the importance of cotton, cattle raising has developed. Because of heavy demand for beef in the country it is also the leading importer.

Argentina: Even though Argentina has only 5 per cent of the world cattle, due to its small population it meets one fourth of the world export requirements. Extensive grasslands, mild climate, nearness to the ports are the other factors that stimulated the cattle raising for beef. Pampas region and Patagonia Plateau are the important regions.

Australia and New Zealand: These countries together have only 2.2 per cent of the total world cattle, but they account for 33% and 11% of world beef exports respectively. In Australia beef cattles are reared in the northern savanna lands. Here the seasonal character of grass growth seriously limits the number of cattle to be raised. Due to unfavourable climatic conditions and poor grass growth the quality is very low. In New Zealand beef cattle rearing is only subsidiary to sheep farming.

Europe and Soviet Union: In Europe due to high density of population cattle rearing for beef has not well developed as that of Dairy farming. Soviet Union, the third largest in the number of cattles, is the second largest producer of beef. The wide expanse of semi arid land in the south and east have favoured the raising of beef cattle.

Milch Cattle

The cattle kept for milk is known as milch cattle. Dairying, rearing of milch cattle, is carried on in many parts of the world. Milk is the most important product and is consumed by all people irrespective of their religion, culture, etc. Butter, cheese, milk powder are the other products derived from milk. The technically advanced countries dominate the milk production. Two thirds of the output comes from Europe and Anglo America.

The temperate lands are best suited for dairying and hence they are well advanced. The factors behind the development of dairying in these countries are,

(*a*) Mild climate: Moderate humid climate not only increases the milk production per head but also the growth of good forage grasses and allow long grazing season.

(*b*) High standard of living in these countries.

(*c*) Nearness to markets. Since milk is perishable, transportation of milk to the markets should be made quickly.

(*d*) High density of population in these countries creates a heavy demand for milk, and

(*e*) Technological development.

Important Dairying Regions

Even though dairying is carried on in many parts of the world, it has intensively developed in four regions of the world. In these regions scientific dairying is practised where cattle is kept indoor; various machines are installed to aid milking, cooling of milk and conversion of milk into milk products. Grasses like alfa-alfa

are raised in the fields to feed the cattles. Heavy capital investment is required to run a modern dairy in these countries.

The important dairying regions are:

1. North-eastern Coast of North America.
2. North-western Europe.
3. South-eastern Australia.
4. New Zealand.

1. *North-eastern Coast of North America*

Dairying is important in the eastern and north-eastern parts of U.S.A. and south-eastern parts of Canada. Favourable climate for dairying, high density of population, availability of easy transportation, unfavourable terrain and climate for agriculture have made this region to practise dairying. This region accounts for 50% of the total milk production of U.S.A. and 60% of Canada. In 1971, this region produced about 65.9 million metric tons of milk, 1.76 million metric tons of butter and 1 million metric tons of cheese.

2. *North-western Europe*

High degree of industrialization and oceanic climate makes dairying the most important. Short growing season makes agriculture unsuitable in the northern Europe. Hence only grasses like alfa-alfa and other fodder crops are raised to feed the milch cattle. Denmark and Netherlands are the famous countries in dairy products not because of their amount of production but because of their specialization, quality and export of dairy products. In Denmark dairying is carried on co-operative basis. In 1971 4.4 million metric tons of milk, 131,000 tons of butter, 111,000 tons of cheese were produced. In the world trade, 20% of the butter supply comes from Denmark. Netherland is the other notable exporting country. In 1971 the production amounts to 8.3 million metric tons of milk, 121,000 metric tons of butter and 279,000 metric tons of cheese. Nearly 6% of butter and 12% of cheese in the world export is accounted by this country.

The other important countries are Switzerland, France, West Germany, Soviet Union, U.K. and Italy.

3. *South-eastern Australia*

This region is the dairy belt of Australia. This is the area of most mild climate and best distributed rainfall for the growth of grasses. Most of the milk is sent to factories to convert into milk powder, butter and cheese for export. In 1971, 7.3 million tons of milk, 224,000 tons of butter, 76,000 tons of cheese were produced. Of the total world exports, 18% of butter and 8% of cheese were exported from here.

4. *New Zealand*

Mild oceanic climate and mountainous country makes dairying indispensable. Grasses and other fodder crops are raised in the fields to feed the cattle. The climate is the most congenial for the cattle. In order to maintain the quality, dairy products are continuously tested by the government. In 1971, 6 million tons of milk, 240,000 tons of butter and 100,000 tons of cheese were produced, and of the world exports, New Zealand accounted for 36.7% of butter and 30% of cheese.

In spite of the drawback that Australia and New Zealand are far away from the world markets and low density of population, these countries are popular as important exporters of milk products. Introduction of refrigeration facilities has made possible the development of dairying and to compete with other nations.

SHEEP

Sheep rearing is carried on for both mutton and wool. Sheep is found in large numbers in the grasslands of arid and semi-arid lands where cattle cannot graze. Australia, Soviet Union, China, New Zealand, India, Argentina, U.K., Brazil, South Africa and U.S.A. are the important sheep rearing countries. Due to low density of population, New Zealand accounts for 63 per cent of the world exports of mutton; Argentina 20 per cent and Australia 12 per cent. England is the largest importer.

Wool is another important product. Australia is the largest producer and exporter in the world. Australia, New Zealand, Argentina and South Africa account for 80% of world exports. Of this 50% is imported by Europe. Soviet Union, U.S.A., U.K., France, West Germany are the leading importing nations.

TABLE III

Wool Production (1975)

(in Million Quintals)

Country		Production
Australia	...	4.5
Soviet Union	...	2.9
New Zealand	...	2.1
Argentina	...	0.8
South Africa	...	0.6
China	...	0.4
India	...	0.4
Other countries	...	4.0
World Total	...	15.7

HOGS (PIGS)

Pigs stand next to cattle in tonnage of pork contributed to the food supply. They are the most efficient animals in converting pounds of feed to pounds of pork. They are adapted to all surplus farm production and it reaches slaughtering size very quickly. Pigs can live in a variety of natural environments. Pigs are almost absent in Muslim countries as their religion prohibits the consumption of pork.

China is the leading producer as well as consumer of pork. It has more than one third of the world total, with 242 million heads. Soviet Union ranks second in pork production. The other leading countries are U.S.A., Brazil, West Germany, France and other North-west European countries. Denmark, Netherlands, Ireland and Poland are the leading exporters and England is the major importer of pork.

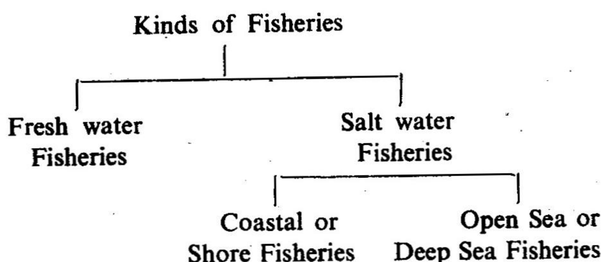
FISHERIES

Fishing is one of the earliest occupations of man, even earlier than agriculture. Fish forms the easiest available food to man. Fisheries offer an abundant and almost inexhaustible nutritious

food supply. Fish provides 4 per cent of the total food supply. Even though the amount of fish production in the world is very small when compared to any one of the major food grains, fish is very important in the food supply and economies of many countries. Several by-products are also derived from fish in the form of animal and poultry feed, fertilizers and fish oil.

Kinds of Fisheries

Fisheries can be classified as freshwater fisheries and saltwater fisheries. Saltwater fisheries can further be divided into coastal or shore fisheries and open sea fisheries. Freshwater fish is



obtained from rivers, lakes and other inland water bodies. Nearly two thirds of fresh water catch comes from eastern and southern Asia. Freshwater fisheries account for only 12% of the world catch. Saltwater fisheries account for the remaining 88% and hence they are commercially important. Fisheries can also be divided into Temperate and Tropical Fisheries.

Factors Favouring the Development of Fisheries

1. The presence of vast areas of shallow water to stimulate the growth of planktons which form the main source of food for the fish.
2. The demand from the fish consuming population, and
3. Technological development of the countries.

Fishing Grounds

Important fishing grounds are found in the vast areas of shallow water away from the shore. Especially in the North Atlantic, North Pacific and eastern and northern Indian Oceans, the continental shelves extend for a long distance into the oceans from the

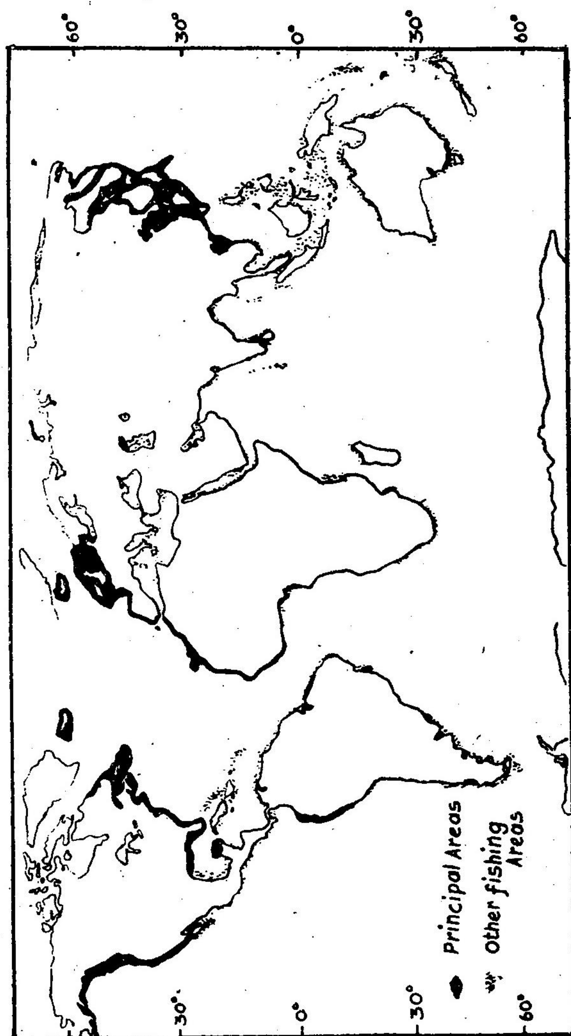


FIG. 4.3 Major Fishing Grounds of the World

shore. In addition to this, there are several submarine plateaus or 'banks' in the ocean which cover large areas. The depth of water in the continental shelves and banks are very shallow. In these shallow waters, planktons, microscopic life forms thrive. Since planktons form the main source of food, fishes are found in abundance in these waters.

Temperate Fisheries

All the important fisheries except south-eastern Asia lie in the temperate zones. The presence of extensive continental shelves and banks is one of the main reasons for the development of fisheries here. The cool waters of the temperate regions are characterized by the presence of fewer varieties. Moreover the temperate climate with its low temperatures preserves the catch considerably for a long-time. Extensive ocean currents and mixing of cold currents from the Polar regions and the warm currents from the Tropics in these regions not only determine the supply of plankton but also the particular route the 'fish shoals' (groups) to follow. The fishes have the habit of moving together in large shoals and sometimes these shoals may be several kilometres in extent. Hence fishing in large quantities is very easy. For all the above reasons the fisheries have well developed in the temperate regions.

Tropical Fisheries

The fisheries have not developed in the Tropical regions. The continental shelves are very narrow except in South Eastern Asia. The plankton on which fish depends is limited in the Tropical seas. Moreover in these waters, there are several varieties of fish which make the commercialization more difficult. The catch decays very quickly due to the hot climate. On the other hand, the fertile river valleys sustain very dense population and there is no large necessity for fishing.

Important Fishing Countries

Of the total catch three fifth is accounted by six nations. Peru alone accounts for 18 per cent. Japan, Communist China, the Soviet Union, the U.S.A. and Norway are the other leading countries of fishing.

(1) *Peru:* Peru is the largest fishing country in the world. Growth of fishing in this country is very recent. In Peru commercial fishing has risen from almost nothing in 1938 to its present commanding position. The Peru current drives 'anchovies' fish towards the coast of Peru. The fishing in Peru is very simple and it cannot be comparable to that of any other developed fishing countries. Country built boats fitted with motors, catch 50 to 60 tons of fish daily. Nearly 125 plants process the fish for export. About one third of the total catch is exported as fish meal. This accounts for the one fourth of the total exports of Peru.

(2) *Japan:* Japan dominated the world scene as the leading fishing country for three decades. Only recently Japan has become the second largest fishing country after Peru. The meeting of two ocean currents, the warm Kuro-Swo and cold Kurile currents make the coastal areas of Japan, one of the very fertile fishing grounds of the world. Long broken coastline, limited agricultural land, ready domestic market, absence of other animal foods make the 10 per cent of the population directly depend upon fishing. In 1969, the production was 7.3 million metric tons and Sardine, Herring and Mackerel are the important varieties caught.

(3) *China:* China accounts for 11 per cent of the world total catch. The fish catch has doubled in the recent years. Nearly one third of the catch comes from fresh water and the remaining from the offshores of Yellow and China Seas. Slow growth in agricultural production has developed the fishing as a supplementary source of food to its growing population.

(4) *Soviet Union:* Soviet Union is another important fishing country in the world. Freshwater fisheries account for the 10 percent of the total catch. Important fishing grounds are in the northern Atlantic Ocean, Bearing Sea, Northern Pacific Ocean and Black Sea. The fishing varieties include Sardines, Anchovies, Herring, etc.

(5) *U.S.A.:* Fishing is carried on both the coasts of U.S.A. namely Atlantic and Pacific Coasts. Pacific coast accounts for more than one third of the catch; New England States for another one third and the Gulf States for more than one fourth. The Great Lakes supply the remaining. Soft skinned fish varieties like Salmon, Tuna, Menhaden, Flounder and Haddock and the Shellfish Shrimp are the principal varieties of fish caught.

(6) *Canada:* Nearness to Grand Banks, the meeting of the cold Labrador and the warm Gulf Stream and the extensive continental shelves make the Canadian coast one of the important fisheries of the world. Lobsters, Cod and Salmon are the important varieties caught. Half of the catch comes from the Atlantic coast, nearly over one third comes from Pacific coast and Great Lakes account for the rest.

(7) *Europe:* North Sea fisheries are the most important in Europe. The presence of Dogger Banks in the North Sea, Gulf Stream and broken coasts are the important factors contributing to the growth of fishing in the North West European countries. Norway, Sweden, U.K. and Denmark are the countries of notable importance. India and other Far Eastern countries in Asia have also considerable fishing.

TABLE IV

Fish Catch in the Important Countries of the World—1969

Country		Fish Catch (in Million Metric Tons)
Peru	...	9.5
Japan	...	7.3
China	...	5.8
Soviet Union	...	4.2
U.S.A.	...	3.4
Norway	...	1.7
India	...	1.3
U.K.	...	1.0

In many densely populated countries, where prospects to increase the agricultural production are meagre, fishing offers a lot of scope to supplement the food production. In many countries fishing is still primitive. In addition to mechanization of fishing, better infrastructure facilities will certainly boost the fish catch in these countries. Fishing offers the promising hope to feed the starving millions in the developing countries.

CHAPTER V

ENERGY

Introduction

Energy is the most indispensable component in the economic development of a country. The nature and the speed of economic development is intimately related to the control and the use of energy. A low level of energy consumption in an economy is an indication of underdevelopment—for economic growth consists essentially of increasing the average productivity of a labour force. And this in turn is directly influenced by the Quantity of energy which can be incorporated within the production process. There exists a perfect correlation between energy consumption and the standard of living of the countries and regions. Hence, a greater importance has been given for the discovery, consumption and conservation of energy among all the nations of the world today.

The present uncertainties characterizing the world of energy supply and demand, have prompted attention to this sphere of activity. Increasing energy consumption, changing preferences for different sources of energy, growing dependence on foreign supplies, and the resulting pressure on national economies and international policies are causing Government and industrial leaders to continually re-evaluate their policy decisions. Larger volumes of energy have demanded new types and forms of transportation media. New routes have been established for transporting energy, and old routes expanded. Old and new energy producing regions have expanded while occasionally the exhaustion of energy resources or a changing market has caused the decline of once important regions.

To provide the energy needed during the rest of this century, new discoveries of the traditional energy resources must be located and developed. At the same time, research must be undertaken which hopefully will allow for the economic utilization of such energy resources as solar power, geothermal power, and hydrogen fusion.

Man affects the environment in varying degree when he produces those resources needed to provide energy. The extent and kinds of change imposed on the landscape vary with the scale of assault for the particular resource. Although significant changes have taken place in past history, man is most concerned today with the impending on slaught demanded by tomorrow's energy needs. This applies not only to those energy resources expected to be consumed by the advanced nations but also to those by which the underdeveloped nations will seek to improve their level of economic development.

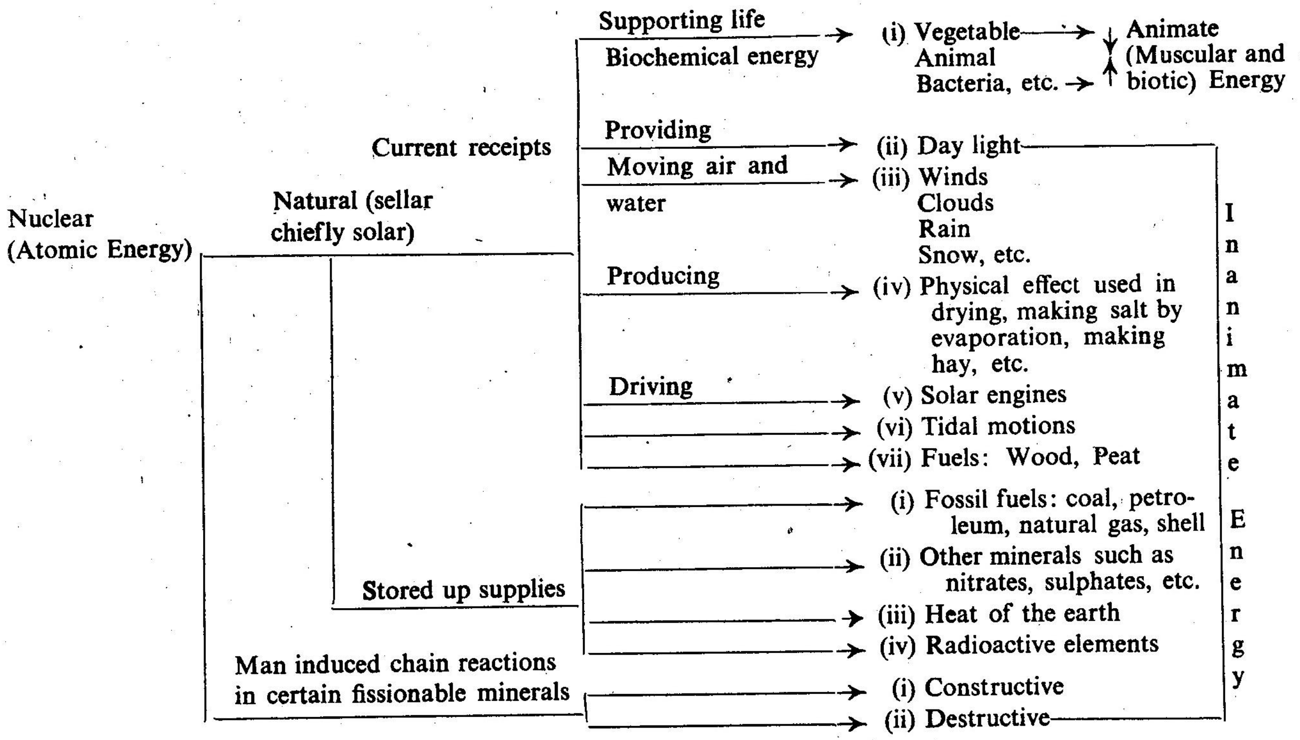
Classification of Energy

Energy may be classified as being animate and inanimate. Human beings, draft animals, and wood are examples of animate energy. Coal, natural gas and water power are considered to be inanimate. Energy may also be classified as being renewable and non-renewable. Renewable forms include wood, the wind, the sun, the tides, geothermal steam, water power, animals and human beings. Coal, petroleum and natural gas are examples of non-renewable energy resources (Table I).

Renewable Energy

The major advantage of renewable energy is that the source of energy is renewed by natural means. Water power is renewed via the evaporation-precipitation cycle, although the distribution of precipitation varies extremely throughout the world, and in any given area may vary greatly from year to year. Ground water seeping beneath the earth's surface, may come in contact with very hot rocks, thus resulting a flow of natural stream or hot water for possible use by mankind. The changes in the amount of gravitation force exerted on the ocean waters by the daily and monthly changes in the relative position of the sun, the moon and the earth produce tides which occur unequally along the shores of the continents. This tremendous source of energy is used so little today. Atmospheric changes resulting from absorption or loss of radiant energy from the sun produce winds which continually vary in intensity, direction, duration and location. Even through extreme amounts of energy are concentrated in the winds of tornadoes and

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hurricanes, man has not yet been able to harness this power source. Limited success has been achieved by using the windmill.

The potential energy that might be obtained from the sun is limited by the interruptions brought on the night time and cloud cover. The world's forests reproduce themselves naturally although in some select areas man speeds up the process by transplanting seedlings.

Man power is used in many nations because it is cheap and abundant when compared to the other energy sources. Of the above-mentioned renewable energy resources, man power is most significant in providing concentrated energy in the form of electricity for large scale use.

Non-renewable Energy

Coal, petroleum, natural gas and uranium are the major forms of non-renewable energy. Once the energy has been produced by burning or fission process, new source of energy must be located and used. Since these sources have been produced over geologic time, it is impossible to wait for the creation of new supplies. Thus the search to find new, economically feasible deposits to develop, will continue and research will hopefully improve our utilization of these energy sources in order to extend the supply.

Man and Animal Power

In some nations, the cheapest form of energy is available in human labour. This might be due to lack of low cost, local or imported energy which encouraged the use of human labour. On the other hand it might be due to the fact that the government has to provide jobs to all people.

In a primitive society, human energy is always available to do the work involved in hunting and fishing, farming, building shelters for man and animal and collecting wood for burning. Man's energy is thus always with him, ready to perform desired task. Yet he is sometimes faced with the need to use his energy to gather wood and transport it to the place of use.

Man in the early days learned the advantage of having animals to do some of the work and thus he began to domesticate the animals native to the area or introduced those which could adapt

to physical characteristics of the region. Animals have been applied to a long list of tasks in a variety of environments. Even today in many societies there still exists situation in which an animal is the best form of energy for the people due to its cost, capacity and utility. But the continued use of animals is under constant threat from new types of machinery, such as the snow mobile in place of Eskimo dog, or the two-wheeled garden tractor in the place of Asian water buffalo.

Animals must be considered in another way as a source of energy for man. Especially in the nations of the Middle East and Asia where firewood is scarce and thus expensive, dried animal manure is commonly used as fuel. Although this provides a form of energy needed by the people, in many such areas manure is badly needed to enrich soil.

CHARCOAL

Charcoal is wood which has been freed from its hydrogen and other volatile contents by heat. The heating process takes place in a kiln, which may or may not capture its by-products. The most important by-product is wood alcohol. Charcoal is a desirable product because it is almost pure carbon, burning freely and steadily. The conversion of wood to charcoal also reduces the bulk of firewood.

Charcoal can be made in rather crude kilns fashioned in or near the forests. This process will reduce the weight of some of the best charcoal wood to about 20% of weight reduction.

In the United States, it is estimated that wood reached its peak in 1850 when it supplied 90% of the energy needs of the nation. But due to the popularity of coal the percentage has come down to 21 per cent in 1900 and today it is less than one per cent. This clearly shows how the changing pattern in the consumption of energy has reduced the significance of charcoal.

Statistics on wood consumption are difficult to obtain and usually are derived from educated guesses for large areas of the world. On world basis, it is estimated that wood which produced about 10% of the world's energy in the mid-sixties continued to decline.

In the early development of iron and steel industry in the United States, Pitsburg became important because of the initial supply

of iron ore in the area, and abundant forests, which served as the source for making charcoal, the major fuel used to retain the iron ore. With the discovery of the superiority of coking coal in the iron and steel industry, the use of charcoal was abandoned.

PEAT

Peat is the earliest stage in the development of coal. It is composed of partially carbonated decayed vegetation which was originally deposited in water and sometimes covered by silt. Peat can be mined or cut from a peat log or 'peat bank' which is usually found near the ground surface.

The basic task in producing hand won peat or turf, is to cut into chunks or sods with an axe or somewhat similar tool. It is then stacked near for the initial drying process during which the water content is reduced to about 35% by evaporation. Since the relatively dry air is the mechanism for drying peat, it is harvested only in spring and summer months.

On a worldwide basis, peat production represents less than one per cent of the total energy production, with little prospect for expansion.

The production of peat represents an interesting phenomena in an age of ecological concern. Peat log are a definite characteristic of the cultural landscape.

COAL

Coal is a black or brownish black, solid, combustible mineral substance formed by the partial decomposition of vegetable matter. It is formed under the earth without free access of air and increased pressure and temperature. The substance is widely used as a natural fuel and it contains carbon, hydrogen, oxygen, nitrogen and sulphur as well as inorganic constituents that are left behind as ash after burning. Historically coal is acknowledged as the fuel which made possible the industrial revolution.

Coal is formed from the remains of woody and herbaceous swamp plants which were covered first by water and finally by one or more layers of sediment. With the passage of time, the thick

vegetation of these swamps became peat, protected from complete decay by its submergence in water. As heat and pressure are applied to its partially decayed vegetation by the addition of more sediment and rocks above it, coal is formed.

The lowest form of coal is lignite or brown coal. It is friable and has a low heat rate per unit weight. Additional heat and pressure can produce bituminous or soft coal. This is the source of coke.

The highest form of coal produced in areas which have experienced very high temperature and pressure due to the folding and faulting of the rock, is anthracite or hard coal. This coal is usually the most expensive to mine.

Kinds of Coal

Depending upon the proportion of fixed carbon, volatile matter and moisture ten types of coal have been identified. They are: (1) lignite, (2) sub-bituminous, (3) bituminous—low rank, (4) bituminous—medium rank, (5) bituminous—high rank, (6) semi bituminous—low rank, (7) semi bituminous—medium rank, (8) semi bituminous—high rank, (9) semi anthracite and (10) anthracite. The following diagram very clearly shows proportion of fixed carbon, volatile matter and moisture in the various types of coal. Eventhough there are nine types of coal the lignite, bituminous and anthracite coal are generally referred.

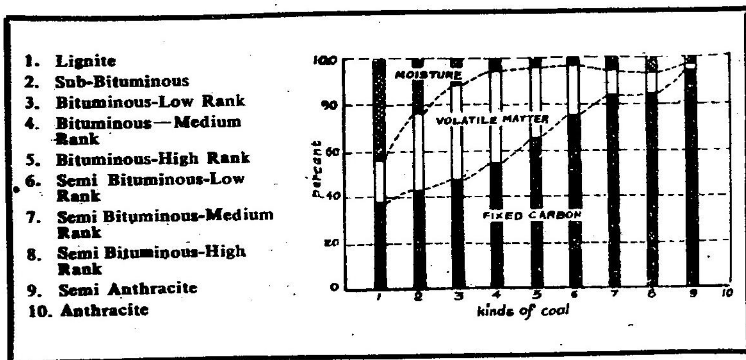


FIG. 5.1 Contents of Different Kinds of Coal

Lignite

True lignite is brown or has a distinctly brownish cast. The higher grades vary from dark brown to almost black. It is characterised by a high moisture content, generally about 40% of the weight when mined. The fixed carbon content is also about 40%. The structure is fibrous and in some cases, woody. In the United States extensive deposits are found in North Dakota, North South Dakota and Eastern Montana. Russia has large deposits of lignite. The most extensive ones are located in Krasnoyarsk area of Siberia near the upper Yenisei River. It is also important in central Ukraine and Moscow Basin. In Europe extensive beds of lignites are found in North German lowlands. You may be aware of the fact that lignite is mined at Neyveli in Tamilnadu.

Bituminous

Bituminous coals are usually black, varying from dead black to highly lustrous. The moisture content is relatively low, the fixed carbon content ranges from about 50 to 80% and that of volatile matter from 40 to 15%.

Anthracite

Anthracite is a hard and dense coal which is relatively free from iron compounds and moisture. The amount of fixed carbon is as high as 95%. It is jet black in colour, and lustrous. The anthracite is slow burning, but hot coal which has a minimum of obnoxious odours, coal dust and residue ash.

World Coal Production

Even though there are about ten leading coal producers in the world, the United States ranks first in coal production. There is a narrow margin between the United States and Soviet Union. This might be due to increased energy demand, especially for electricity produced in part by coal-burning power plants, pushed the American production up, while production slumped somewhat in the Soviet Union. China ranks third in the production of coal. This is followed by East Germany, West Germany, Poland, etc.

TABLE II

The Ten Leading Coal Producing Nations in the World (Bituminous, Anthracite and Lignite)—1970

Rank	Country		Production in Million Tons
1.	United States	...	596.96
2.	Soviet Union	...	595.55
3.	China (estimated)	...	400.00
4.	East Germany	...	288.67
5.	West Germany	...	270.18
6.	Poland	...	190.55
7.	United Kingdom	...	148.31
8.	Czechoslovakia	...	121.07
9.	India	...	85.14
10.	Africa	...	58.35

India is in the nineth position and it is only 2/3 of the production of Czechoslovakia. China possesses somewhat outstanding fields and very large reserves. The East Germany's production is lignite while that of West Germany's is mostly bituminous.

Coal Production in the United States

The coal fields of the United States are usually, Interior Gulf Coast, Northern Great Plains, Rocky Mountain and Pacific Coast. The important coal producing States are West Virginia, Kentucky, Pennsylvania, Illinois, Ohio, Virginia. Indiana, Alabama, Tennessee and Wyoming.

Coal Production in Europe

There are four major areas of coal production in Europe. (1) Great Britain; (2) The North-West continental area which includes the Ruhr and other fields of West Germany and extends through the Netherlands and Belgium into North France; (3) The Silesian field of Southern Poland; and (4) The Donets Basin of Southern European

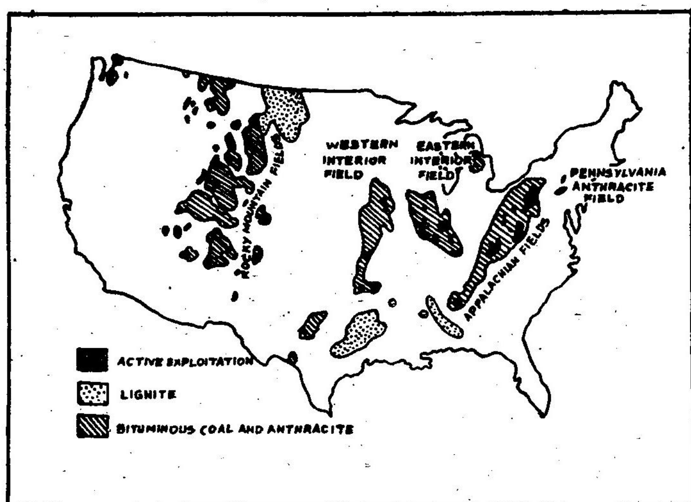


FIG. 5.2 Leading Coal Fields of United States

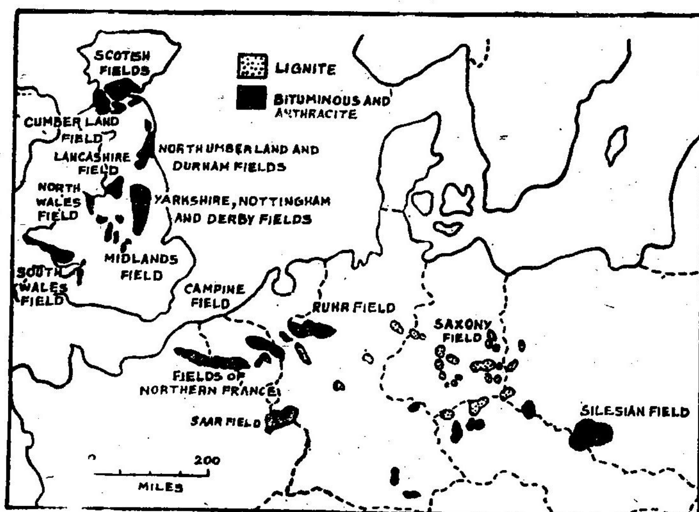


FIG. 5.3 Leading Coal Fields of Europe

Russia. Secondary centres are the Saar district, the Moscow field and the smaller producing fields of Southern France, Czechoslovakia, Hungary and Spain, Britain and Germany. Mostly West Germany, to a lesser extent East Germany have long been the two leading coal producers in Europe.

Coal Production in Asia

The reserves of coal within the area of Soviet Union are very large, but on the basis of energy content over 85% of the coal is located in Asiatic Russia, east of the upper Ob river, and along the middle and lower Yenisei river and its east bank tributaries and in the Lena river basin. The Donets Basin is the most fully exploited Russian Coal regions. It is stated that the Pechora field, located beyond the polar circle on the West flank of the Ural mountains, whose reserves are estimated to exceed those of Donets Basin. In Asiatic Russia coal mining has greatly expanded in the Kuznetsk Basin, in the Kansk-Achinsk Basin in the east; and in the Karaganda Basin of Turkestan, located north-west of Lake Balkhash.

TABLE III

Estimated Coal Reserves of the World

(in Million Tons)

Region/ Nation	Anthracite, Bituminous and Sub-bituminous Coal	Lignite and Brown Coal	Total All Coal	Percentage of World Total
Asia				
U.S.S.R. ...	1,099,796	222,604	1,322,400	19.9
China ...	1,114,122	661	1,114,783	16.7
India ...	68,795	560	69,354	1.0
Japan ...	10,906	284	11,191	0.2
Others ...	5,192	4,196	9,388	0.1
Total ...	2,298,811	2,28,305	2,528,116	37.9

North America				
United States ...	2,288,810	921,250	3,210,060	48.2
Canada ...	68,844	26,944	95,788	1.4
Mexico ...	4,745	—	4,745	1.4
Total ...	2,362,399	948,194	3,310,593	51.0
Europe				
Germany ...	247,179	68,324	315,503	4.8
United Kingdom ...	188,096	—	188,096	2.8
Poland ...	88,160	20	88,180	1.3
Czechoslovakia...	7,108	13,775	20,883	0.3
France ...	13,541	474	14,015	0.2
Belgium ...	6,599	—	6,599	0.1
Netherlands ...	3,747	—	3,747	0.1
Others ...	2,889	24,414	27,414	0.4
Total ...	557,319	107,007	664,437	10.0
Africa				
Republic of S. Africa ...	74,936	—	74,936	1.1
Others ...	1,818	220	2,039	—
Total ...	76,754	220	76,975	1.1
Australia				
Australia ...	18,514	45,182	64,670	1.0
Others ...	109	865	974	—
Total ...	18,623	46,047	65,644	1.0
South and Central America				
Columbia ...	13,224	—	13,224	0.2
Venezuela ...	3,381	—	3,381	0.1
Others ...	3,919	280	4,199	0.1
Total ...	20,524	280	20,804	0.4
World ...	5,333,730	1,330,053	6,664,569	101.4

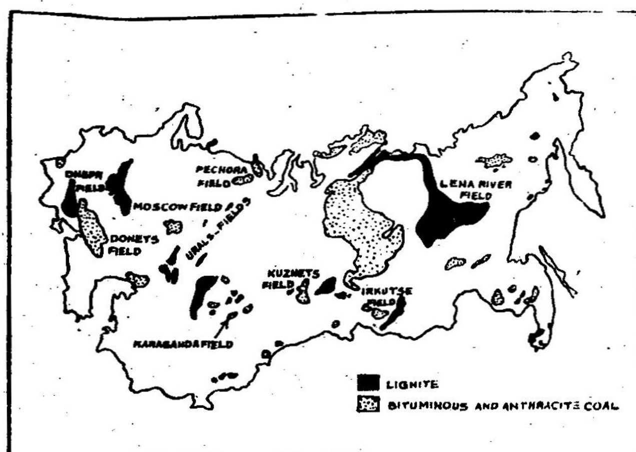


FIG. 5.4 Leading Coal Fields of the Soviet Union

Huge coal deposits have been reported to exist in China and it is on par with those of the United States. Manchuria and Northern China contribute 2/3 of the entire output of China.

Many small coal fields occur in Japan particularly in Honshu and Hokkaido, where qualities vary from low-grade bituminous to high-grade coaking coal.

In India the Northern and Central India are having rich reserves. They are estimated to be at least 4 or 5 billion tons of easily accessible high quality coal. The Bihar and Orissa fields are the largest and most promising for continued exploitation.

In South America, Chile, Columbia and Brazil are the countries with substantial output. The coal mining in Africa, Australia and New Zealand are not so important on a world-wide basis.

The Coal Reserves of the World

The estimated reserves of various countries are shown in Table III. The table clearly reveals that North America accounts for about 50% of the coal reserves of the world. Asia accounts for about 38% of the world's estimated total coal reserve. The entire Europe accounts for only 10% of the world's estimated coal reserve. North

America, Asia and Europe put together account for about 97% of the world's estimated coal reserves. Further it is found that the coal reserves are concentrated in the Northern hemisphere.

Factors Affecting Coal Production

Many coal deposits of the world lie undisturbed for a variety of reasons, most of which relate to the cost of producing and delivering in the coal market. One factor is the depth of the deposit beneath the surface of the ground. The deeper the coal, the greater the cost for lifting it to the surface. A best example for this is the Appalachian fields which are not mined due to greater depth of the coal seams.

Another production factor is the interplay between distance to market and intervening opportunity. If production costs about the same at two different mines producing the same grade coal for the same market, the closer mine will be able to dominate the market. Intervening market can be explained by using the previous example. The more distant mine (100 miles away) was once the sole superior of the market which paid the price asked by the mines management. Then the second and closer mine opened its coal operation, and it could produce the same grade coal as the more distant mine and sell it at a lower price. It is due to shorter haul required for moving the coal to the market. Thus the management of the mine was successful in part because of its location represented an intervening opportunity in the scale of coal to the city. The more distant mine's management must now decide whether or not to shut down its operations, seek another market, or determine if there is always a means if reducing its mining and transportation cost with the new mine.

Another production factor is the degree of mechanization used in mining the coal. Strip or surface mining usually has the highest production per worker due to the use of huge machines to clear away the over burden and dig out coal. Although the cost of such machinery is very great, the small labour requirement with the corresponding high productivity per worker combine to produce coal at the lowest cost. Underground mines have a greater investment in the shafts and tunnels and incur greater costs in lifting the

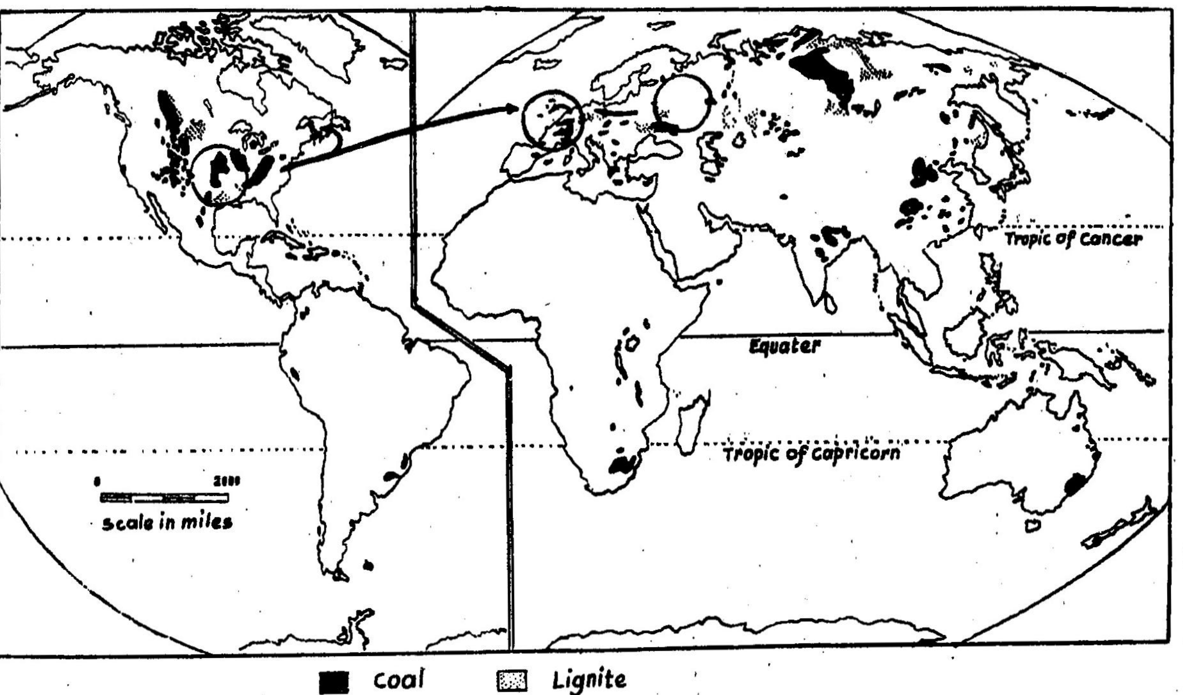


FIG. 5.5 Consumption, Production, Import and Export of Coal

coal to the surface and operating the lighting, ventilation and transportation systems, but mechanization can greatly increase productivity per worker. The statistics reveal that the output per man per day in terms by strip mining is highest when compared with underground mining.

PETROLEUM

In the present world petroleum and its products are effecting changes in man's modes of life. The remote villages are becomming integrated with the modern world by means of trucks and jeeps. Petroleum was used as an ointment by the people of ancient Mesopotomia long before the beginning of the Christian era.

It is generally believed that oil was formed from the remains of very small animals and plants which lived in the shallow seas hundreds of millions of years ago. As these died in great quantities, their remains drifted to the bottom of the sea where they mixed with sand and mud to become marine sediment. Later, this was covered by layers of other sediments which eventually turned into rock. The theory is that with the passage of time and the movement of the earth's crust, heat and pressure were brought to bear upon the plants and animals and that combined with their decomposition, formed oil.

Crude oil varies considerably from oil field. In general it is composed by weight 95% hydrogen and carbon compounds with a variety of substances most notably sulphurs. Crude oil containing hydrogen sulphide is referred to as sour petroelum. Crude oil is also differentiated by the composition of its base, which can be asphalt (tar), parafin (wax) and mixed base. In general crude petroleum is dark green and greenish black colour, sometimes some oil are pale yellow or red.

Once oil has formed, it must be concentrated into a pool which is large enough to warrant the cost of development. Pools are created by geologic traps. These traps can be divided into three groups such as structural, stratiographic and structural stratiographic (Fig. 5.6.). Structural traps are created by the faulting and folding of rock layers, while stratiographic traps are the result

of gradation. More than 75% of the world's known oil deposits are in structural traps, mainly because these are easier and cheaper to find when compared with stratiographic traps. Further it is felt that the future oil will be discovered from the stratiographic traps. The exploration of petroleum is a time and capital demanding activity. It may easily cost one corporation more than five million rupees a day to support men and equipment in their search on land and offshore for few oil discoveries. Today emphasis is on upon offshore and arctic exploration and hence the cost has gone up in the last decade.

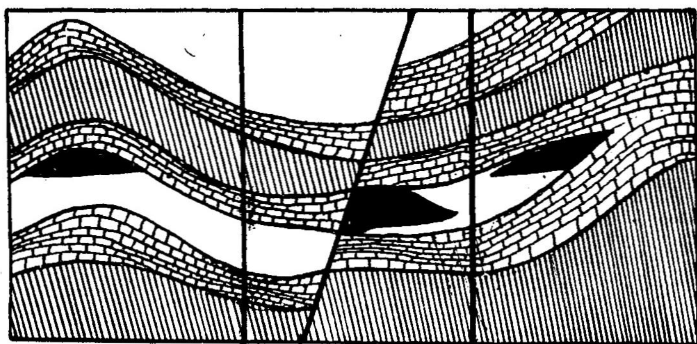


FIG. 5.6 The Three Most Common Oil Traps

Man has been drilling for oil under the sea for the past half century. Every year sees him going to areas more difficult physical conditions and deeper waters. This has necessitated the rapid development of offshore drilling platform.

An oil field is under pressure. The oil is flowing through a permeable layer of sedimentary rock, trapped above and beneath by impermeable layers of rock. This crude oil is mixed with water and natural gas. The density of the natural gas is the least, it rises to the top. Since the density of oil is less than water it tends to float on top of the water. The squeezing of the oil between the layers of natural gas and water represents the field energy. If this field energy is maintained, the oil can be removed from the ground initially by simple opening and closing the system of valves which are installed on the wellhead. These are known as 'christian

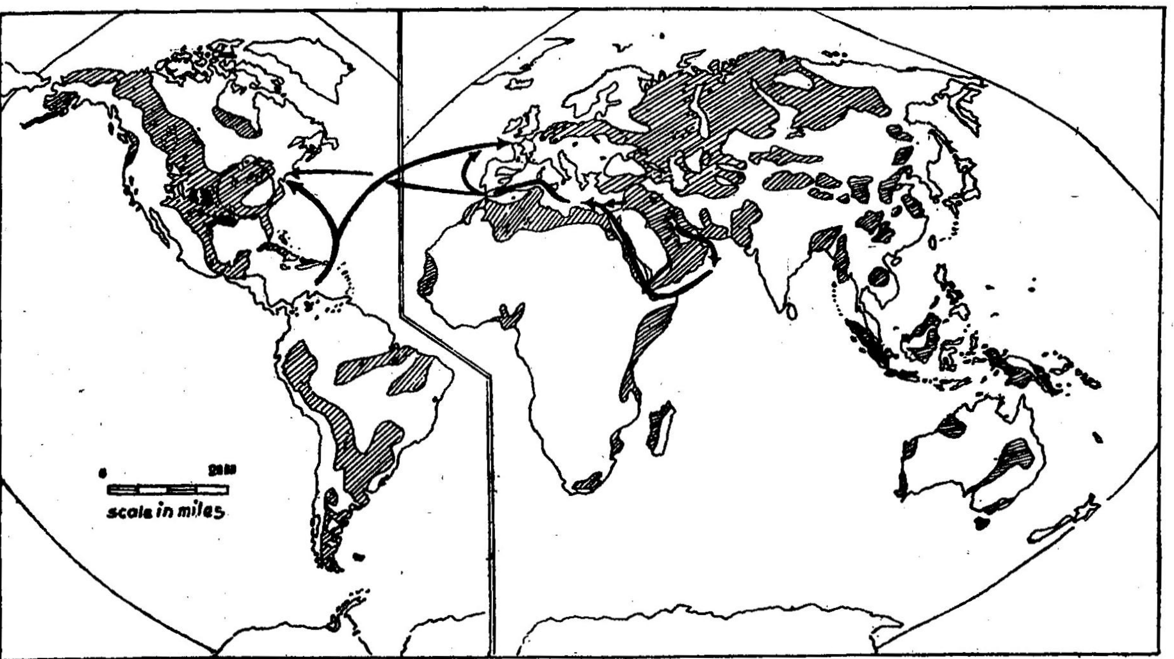


FIG. 5.7 Sedimentary Basins. Fields of Exploitation & Consumption, Production, Import and Export of Crude Petroleum

trees'. But once enough natural gas and water have been removed, the field energy declines to the point where pumps are necessary to pump the oil up to the surface. This results in increased production cost and a smaller yield of oil from the field.

To offset the exposure and difficulties of unlimited drilling in an oilfield, the large oil corporation have shown the way in practising unit pool management. Once the oil is discovered, the appropriate corporations drill production wells to determine the extent of pool and the percentage of oil under each corporation's leased land. Once determined, a few wells on the perimeter are chosen to pump all the oil and this production is then divided according to the predetermined percentage. In this way less capital investment is needed to produce the oil and the development of the field as if it has an owner-unit pool management.

A parallel development of unit pool management has been an attempt to manage the field pressure other than just limiting the number of wells. This involves the reinjection of the water and natural gas back into the pool via non-production wells. Work continued along these lines is an attempt to find better ways to re-mark the remaining oil that is not concentrated sufficiently to be pumped to the surface.

The removal of the oil along with water and natural gas, reduces the pressure which in part has been holding the overlying rock layers in place. The result is subsidence. A classic example for this phenomena is found in the Long Beach—Wilmington region of Southern California. This sinking of the ground took on an eleptical shape, which covered twenty-two square miles and sank as much as twenty-six feet. This resulted in damage and destruction of buildings, highways, pipe lines and the like as well as flooding the area which formerly had been above sea-level.

World Production

The first commercial oil well was drilled in 1857, near the city of Ploesti, Rumania. The first year production of 2000 barrels represented the world's entire production. Two years later near Titusville, Pennsylvania, the first oil well in the United States was drilled. Production from this field was 500,000 barrels in 1860,

FIG. 5.8 Major Oil Regions of the World

and this represented the domination of production which was to continue for many decades. The production of oil by various countries of the world is given below:

TABLE IV

World's Leading Oil Producing Countries—1975
(in Million Metric Tons)

Sl. No.	Country		Production	Percentage of World Total
1.	Soviet Union	...	490.00	18.1
2.	United States	...	468.00	17.4
3.	Saudi Arabia	...	337.30	12.5
4.	Iran	...	268.70	10.0
5.	Venezuela	...	124.00	4.6
6.	Iraq	...	111.30	4.1
7.	Kuwait	...	93.30	3.4

From the table it is clearly seen that Soviet Russia ranks first in the world oil production. It produces about 18% of the world's total oil production. This is followed by the United States, Saudi Arabia, Iran, Venezuela, Iraq and Kuwait. Further it is found that West Asian Countries contribute more than 30% of the world's oil production. The production of oil by various important countries will be dealt later. Before that it would be better to understand the potential oil reserves of various countries so that we can assess the importance of those countries in terms of their reserves and demand. The following table illustrates some of the countries' oil reserves:

TABLE V

Oil Reserves of Selected Countries of the World—1976

Country		Reserves in Percentage
Saudi Arabia	...	22.6
Soviet Union	...	12.2
Kuwait	...	10.3
Iran	...	9.8
Iraq	...	5.2
United States	...	5.0

Middle East countries possess about 58% of the world's total oil reserves. Soviet Union is the second important nation in the world in its oil reserves. However, the United States of America and Venezuela are also important producers of oil.

Soviet Union: The Soviet Union has a long history of oil production, having led the world at the turn of the century. Since 1953, much emphasis has been placed on this sector of the economy, and production has incresed at a rate of more than 20% per year. During this period, a major shift of producing areas has taken place. In 1940, 87% of the total production and 81% of the reserves were in the newer Volga—Urals oil fields. In the Caucasus, the Baku fields led the nation in production until 1954. Then these fields experienced a decline. The Volga—Urals or 'Second Baku' is the growth area with three principal areas, each surpassing the Baku field's production.

As per the information Soviet Union has produced 490 million metric tons of oil during the year 1975. The geologists consider that the oil fields in Soviet Union are the largest. The fields are supposed to extend from Caucasus to Arctic region. The deepest oil field in the world is in Baku region which is about 800 metres in depth. The rich oil reserves are found in Usbeckistan, Caceastan and Turkmen areas. Recently lot of new oil fields have been discovered in West Siberia, Caucasus and central and southern part of Urals. The Baku refinery refines four lakhs barrels of oil per day. Finally it has to be stated that the per capita consumption of oil in Soviet Union is 50 imperial gallons per year. This is about one-tenths of the consumption of an American and about 30 imperial gallons less than British.

The United States: The United States is one of the most important oil producing nations in the world. The energy consumed in the form of oil constitutes 46% of the total energy consumption. In the year 1975 the United States has produced 468.5 million metric tons. This is about 17.4% of the world's total oil production. Discoveries have revealed that 20,040 square kilometer in the United States contain oil. The important oil producing regions are the Appalachian Province, the North-east Indiana, Ohio Province, the Michigan Province, the Illinois, South-west Indiania Province, the Mid-continent Province, the Gulf Coast Province,

the Central Plains Province, the Rocky Mountain Province, the California Province, the Canadian or Northern Plain Province and the Mexican Gulf Coast Province. Texas, Louisiana, California, Oklahoma, Wyoming and New Mexico are the most important oil producing states in the United States.

The important oil fields in the United States are Wilmington (California), East Texas (Texas), Kelly-synder (Texas), Wasson (Texas), Me Arthur River (Alaska), Sho-vel-Tum (Oklahoma), Slaughter (Texas), Midway Sunset (California), Crillon Island (Louisiana), an Tinbailer Bay (Louisiana) and Tibalier Bay (Louisiana). There are about 350 oil refineries in the United States. In 1974 the oil refined in the country was 16.5 million barrels per day. The country has imported less than 10% of oil from Middle East countries.

Venezuela: Venezuela was in the second place till 1969 in its oil production. It pumps about 80% of her oil from the oldest and largest oil field located in Lake Maracaibo area of Western Venezuela. The other newer and smaller oil fields are located next of Orinoco River in Eastern Venezuela.

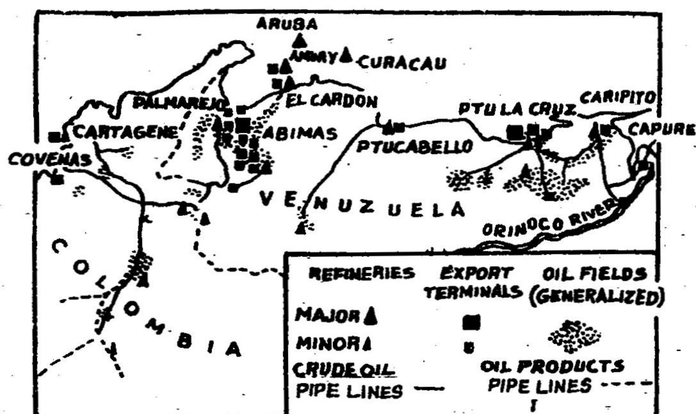


FIG. 5.9 Petroleum Fields, Refineries, Pipelines and Export Terminals in Venezuela

Middle East Countries: Iran, Iraq, Saudi Arabia, Kuwait, etc. are the Middle East countries. The production of oil in the

Middle East began about the turn of the twentieth century. Even though much greater potential was suspected of the Middle East Countries, it was not until post-World War II large scale development was taken up. The major oil fields were discovered in two major areas of concentration. The first and most important were located in areas to the north, west and south of Persian Gulf, while the second concentration was mainly in northern Iraq. It

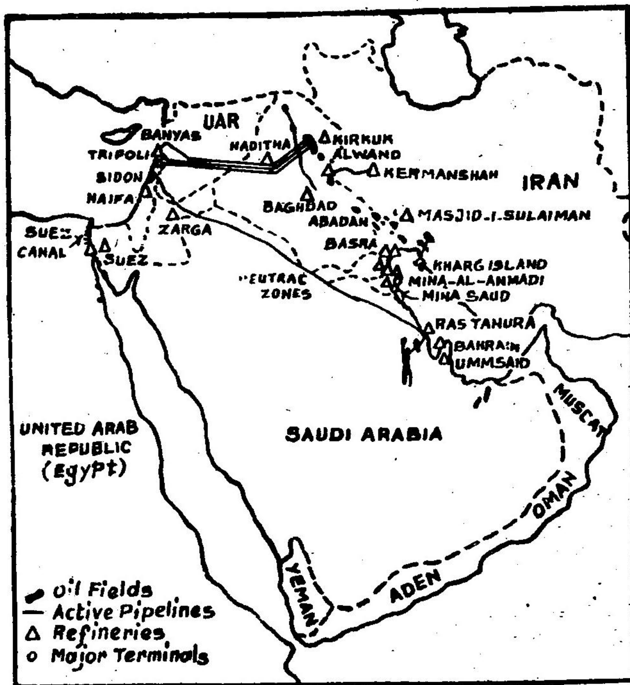


FIG. 5.10 Petroleum Fields, Refineries and Pipelines in the Middle East

has already been mentioned that the Middle East countries possess 56% of the oil reserves of the world. It is estimated that it contains 368,411 million barrels of oil. The oil production here has started increasing from 1938. The production was 6% in 1938 and it has increased to 23% in 1969. It is estimated that these countries will get about 63 million dollars through oil export.

Saudi Arabia: In the south-west countries Saudi Arabia ranks first in oil production. It has produced 337.3 million metric tons in the year 1975. This is about 12% of the world's oil production. The estimated oil reserve in Saudi Arabia is 148.6 million barrels. Here the oil is taken through the pipelines for a distance of 1760 km to Hyba oil refinery. Saudi Arabia exports 90% of its petroleum and petroleum products.

Iran: It ranks fourth in oil production in the world. It has produced 268.7 million metric tons of oil during the year 1975. The first oil well was dug in 1908 in Musjid Suliman. This field extends for about 124 sq. km.

Iraq: The oil fields of Iraq are located near Kirkuk in northern Iraq and in the extreme south, near Basra (Refer Fig. 250 Von Regw). A 1150 mile pipe line of 12″ diameter with a daily capacity of 85,000 barrels was begun in 1932, and completed for active service in 1935. It runs from Kirkuk to Haditha on the Euphrates and from there to Tripoli, Lebanon and Baniyas on the Mediterranean coast. The country's production during 1975 was 111.3 million metric tons.

Kuwait: Kuwait has a total reserve of 10.3% of the world reserve. It has produced 93.3 million metric tons during 1975. Abuthabi, Trueious Coast, Qatar and Bahrin are the important fields around Persian Gulf.

Africa: This continent has never been credited with any large oil potentialities. However, oil has long been produced in Egypt but the production has remained modest.

Major discoveries have been made recently in Libya in the Szrte desert, South of Gulf of Sirda or Syrte. Other major discoveries have been in the northern Sahara and Ouargla oasis and still further south in the Polingnae basin, east and south east of Fort Flatters. Both Algerian and Libyan production has increased rapidly; production is comparatively small in the Republic of Gabon, Angola, Morocco, and few other countries.

Canada: Production in Ontario has started as early as 1848. But due to very small production they have not become popular. In 1920 oil wells were drilled at Norman. In 1946 at Leedock

near Edmonton in Alberta oil wells were discovered. Canada has produced 80 million metric tons of oil in 1975.

Mexico: Rich oil reserves are found near the Gulf of Mexico. The first oil well was drilled in the year 1914. Dastaskas and Decanbeck are the important centres of oil production in Mexico. It has produced 37.5 million metric tons of oil during the year 1975.

In South America oil wells are found in the state of Peru and east of Andes mountains. In Argentina Saldo and in Brazil Salvador, Equador, Chile and Bolivia are centres of oil fields.

In Europe oil wells are found in Rumania, West Germany, France, Italy, Holland, Hungary, Yugoslavia, Poland and Czechoslovakia.

In South east Asia, Indonesia is an important oil producing country. It has produced 63 million metric tons of oil in the year 1975. Oil fields are also found in Sumatra, Borneo and Java.

In Burma rich oil reserves are found in the upper Irrawaddy Basin.

India: Even though oil is produced in India since 1894 still it is not worth mentioning. Till 1915 the average annual production was 8.6 million barrels. The production figure for 1975 was 8.28 million metric tons. Assam, Gujarat are the states which produce oil. Recently Offshore oil production has been started in Bombay High. Investigations are going on to find out the oil resources in the river valleys in Tamil Nadu.

Arab Nations and Oil Problems

One characteristic of oil production in the Arab nations has been the dominance of control in the hands of foreign corporations. The Arabs felt that they received less royalty than their fair share of profit. As a result, the Organisation of Petroleum Exporting Countries (OPEC) was formed in 1960 by Iran, Venezuela and Saudi Arabia. Although Venezuela is not an Arab Nation, it was experiencing the same treatment in bargaining for royalties with the large corporations. These organisations successfully increased the price bv 72% per barrel between 1970 and 1971.

Arab states are being increasingly important not because their ability to produce more oil needed by other parts of the world but also because of the increasing concentration of capital earned by mere sale of oil. Further it is estimated that about 60% of the world's known reserves are possessed by these countries.

Oil Discoveries in North Sea

One of the existing development of recent years has been the discovery of oil and natural gas beneath the North Sea. This triggered interest in Offshore exploration and need for establishing territorial rights to the continental shelf.

After continuous effort, a major oil field was discovered in December 1969. This field, named Ekofisk, is located within the territory assigned to Norway. The reserves estimated to be 3 billion barrels. It is now producing 11,000 barrels per day. In October 1970 the next major discovery was made in Biritish sector. This is known as Forties Field and it is estimated to contain 2 billion barrels of oil. In the same sector another oil field Brent Field was discovered in July 1971. The current estimate of the oil beneath North Sea is 42 billion barrels. This will to a great extent reduce Europe's dependence on Middle Eastern and North African oil fields.

NATURAL GAS

The gas utility industry began in the late eighteenth and early nineteenth centuries. The year 1813 witnessed the formation of the London and West Minster Gas Company, which owned three manufacturing stations and fifteen miles of main and supplied gas for lights. In the United States, Baltimore was the first city to adopt a commercial gas system and burn the lights of her streets via a network of pipes laid down beneath the streets. This was in the year 1816.

Manufactured Gas

Manufactured gas is produced by heating a high-volatile coal in a metal retort. The gas released from the coal is then cooled and

purified before being sent to storage vessel known as a gasometer or gasholder. There are two types of gasometers which use the weight of a single lid, or involved iron can, to keep the gas under pressure.

Manufactured gas varies according to the characteristics of coal being used and the exact process being employed. Some of the manufactured gas include coal gas, coke oven gas, producer gas, blast furnace gas, blue (water) gas, carburetted gas.

Natural Gas

Natural gas is found alone or in association with petroleum. It is colourless, odourless, non-toxic gas which has calorific value about twice that of coal gas. In order to maximize production, the gas should be drawn at a steady rate. In contrast to oil, gas presents storage problems. The majority of the wells producing gas are oil wells. Large quantities of natural gas are produced according to the needs of the petroleum industry. In the early years of the industry, this gas was a waste product, which was burnt up at a pit or tower flares. With the construction of pipelines beginning in the twenties, it became a waste product with a market ready to buy it at low prices. Since so much of expense of exploration was covered by the oil production, the price for natural gas from the beginning has always been very low. The ease and cleanliness of its use, coupled with its low price, made it easy for natural gas to displace oil and coal in most industrial, commercial, and domestic markets when available in sufficient quantities. Since it is free from sulphur, it can be used for direct process heating in certain industries without affecting the product in any way.

The drilling of natural gas employs the same basic principles used in the petroleum industry. The well can be perpendicular, or under certain conditions, directional (slant) drilling is permissible. For example, when trying to tap some offshore gas deposits, directional drilling may greatly reduce development cost, as well as allow for similar production procedures. Field energy is best maintained by limiting the number of wells, and producing the gas at a constant rate.

The removal of natural gas reduces the pressure contained in the porus rocks. As a result, these areas with weakly supported outlying rock layers will tend to sag as the gas is pumped out, causing subsidence. A good example for this is the Po River Valley in Italy. The long history of gas production coupled with the recently weak layers of sedimentary rock typical of this area, has resulted in serious subsidence. Some scholars suggest that this is partly responsible for continued sinking of cities in the area, Venice in particular.

World's Production of Natural Gas

The United States dominates this activity as its domination over the petroleum industry in the earliest days. The United States and the Soviet Union have been dominant because the large gas fields were located in their boundaries. Just four nations are responsible for the production of more than 90% of the world's natural gas.

TABLE VI

The Leading Natural Gas Producing Countries, 1970
(Millions of Cubic Feet)

Country		Gross Production	Marketed Production
United States	...	23,766,453	21,920,642
Soviet Union	...	7,520,000	7,063,000
Canada	...	2,624,247	2,295,278
Venezuela	...	1,710,200	348,630
Netherlands	...	1,118,375	1,107,427
Iran	...	1,094,194	396,333
Rumania	...	875,443	875,443
Saudi Arabia	...	710,940	104,182
Libya	...	683,900	—
Mexico	...	665,026	481,106

From the table it is clearly seen that the United States, Soviet Union, Canada, Venezuela and Netherlands are the most important natural gas producing nations, producing in large quantities. Even though Iran's gross production is one billion cubic feet its marketed production is only 0.3 billion cubic feet. It is striking to note that Libya's marketing production is zero.

It is worth mentioning that in the year 1975 the United States has produced 546,516 million cubic meter of natural gas. Whereas in the same period Soviet Union and Canada have produced 288,996 and 74,928 million cubic meters respectively. So far India has not attained the importance as a producer of natural gas.

The discoveries in North Sea area, Australia, and North America suggest that it is just the beginning of the natural gas industry on a world-wide scale. Till today, little is known of the extent of proven natural gas reserves. The United States and Soviet Union are considered to have 50 per cent of the world's reserves, but this ratio may vary with the discovery of new reserves in near future.

Pipelines have been the most important means of transporting natural gas. Transporting natural gas in a ship, barge, or other transport vehicle is expensive due to space occupied by the gas. Natural gas can be liquefied by reducing the temperature to—258°F, and by pressurizing it to a point somewhat above that of atmosphere. The resulting liquid takes up 1/600 as much space as natural gas, per heating unit.

WATER POWER

The energy contained in falling water has been used for centuries. One of the earliest uses was the grist mill. Grist mills were by necessity resource oriented, located either at a natural waterfall, or at a dam site where man could create reservoir. In United States many towns and cities grew around the mill. The same was true in the case of Great Britain where during the industrial revolution caused the mass development of mills along the streams and rivers flowing down the slopes of the Pennine Mountains.

Water power continued as an important energy source until the advent of the steam engine. Since the steam engine proved to be economical the grist mills lost their importance.

Hydro-electricity

It is more appropriate to call electricity as a form rather than a source of energy because, unlike other fuels and nuclear sources, it is not taken directly from nature but is derived, essentially from man-made generators, which are activised by different forms of energy. Over 70% of all electric energy comes from generators that are driven by turbines powered chiefly by steam which has been heated by coal, petroleum products, natural gas or less common source including atomic energy, or by internal combustion engines powered by gasoline etc. Such energy is called fuel-generated or thermo-electric energy. Nearly 30% is obtained from generators driven by turbines powered by running water. This is called hydro-electric energy.

As technology improved, more distant sites with great potential were developed, allowing the construction of resource-oriented power plants. Hydro-power plants were very popular in the early decades of development of the electric power industry, because, once the dam and plant had been paid off, the electricity generated was essentially free as long as the rivers kept flowing. Many excellent dam sites, however, still remain undeveloped, awaiting the discovery of new technology which would allow more economical transmission of the electricity over long distances.

Factors Affecting the Production of Hydro-electricity

There are a number of physical, economic and cultural factors that govern the production of hydro-electricity. Let us examine them now. The first factor is the favourable site for the location of the plant. A site near a waterfall falling from a greater height is more preferable than other locations. The plant can also be located along a river which carries considerable water throughout the year, without causing frequent floods. The river should not carry large volumes of sediments. The areas of consumption should be closer to the place of production. The place selected for location of the plant should be easily accessible. The water used for generation of electricity can also be used for irrigation.

If the site is at a waterfall, the falling water itself will ease the production. If the river is perennial then the plant can produce

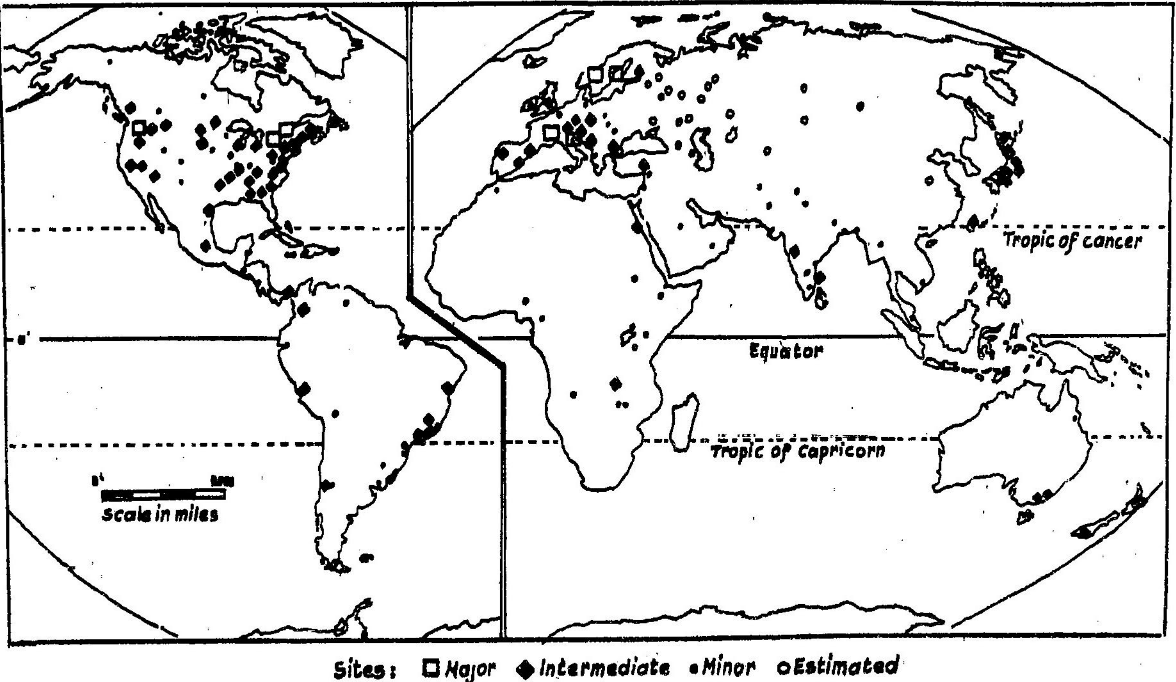


FIG. 5.11 World Distribution of Developed Hydro-Electricity

electricity without any fluctuations. This will increase the power production. If there are frequent floods, the installations may be damaged causing interruptions in the production. In the same way if there is a lot of sediments then the motors may be broken down. The potential consumer market should be closer to the site of production otherwise there will be loss in the energy transmission. Hence the electric energy is generally not transmitted beyond 500 kms from the plant. The construction of dam and power plant involves lot of expenditure. So the countries which could afford this initial investment could utilise this energy resource.

Potential water power resources are found in areas of rugged topography, high and normal rainfall receiving mountain areas. Of the total water power resources Africa has 40%, Asia 23%, North America 13%, Europe 11%, South America 10%, and Oceania 3%. Ninety percent of the developed water power comes from West Europe, United States, Canada, Japan and Soviet Union.

World's Production of Hydro-electric Power

The important countries for the production of hydro-electric power are the United States, Canada and Soviet Union. The following table illustrates this fact:

TABLE VII

Production of Hydro-electric Power of Important Countries, 1974
(in Million KWh)

Country		Production
1. United States	...	303,592
2. Canada	...	210,159
3. Soviet Union	...	132,030
4. Japan	...	82,207
5. Norway	...	76,570
6. Brazil	...	66,960
7. France	...	56,830

United States

In spite of the fact that the United States ranks first in the world in hydro-electric power production, it accounts for only 5% of the total power consumption. Though the potential region is found in the north-western part of the country only the Appalachian region in the east is greatly utilised. Columbia river and its tributaries provide more favourable conditions for the production of hydro-electricity. A number of dams such as Grand Cooly, Hoover, Bonsville and Dallas are constructed across the Columbia River.

The Tennesse Valley Authority is an important project in the East Appalachian region. This multipurpose project is on the Tennesse river, a tributary of Ohio.

Canada

In Canada huge potential water resources are found in Qubec, Ontario and western parts of British Columbia.

Soviet Union

In the Soviet Union the topography and less rainfall provide a most unfavourable situation. Dnieper, Ob, Yenisei and Volga are the important rivers for water power. The biggest hydro-electric plant is found in Siberia across the river Ankara near Bratsk.

Japan

The rugged topography makes Japan a potential hydro-electric power producing country. Since the rivers are short the hydro-electric stations are small and numerous.

The other important countries for water power are Africa, Norway, Brazil and Italy.

TIDAL POWER

A potential source of abundant power is tidal power. The range between the level of water at high tide and low tide may be as much as fifty feet. Tidal power can be harnessed using essentially conventional hydro-electric plant technology. A major problem is that throughout the month, the tides vary between

their maximum level (spring tide) and their minimum level (neap tide). Furthermore, the time of the high tides is continually changing, so one can never depend on generation at a given hour of every day.

The number of high and low tides varies from coastline to coastline. Most coasts experience two high tides and two low tides during a 24-hour period. Some areas have one high tide and one low tide, while other areas experience modest tidal ranges. Examples for this modest tidal ranges is Mediterranean Sea and the Gulf of Mexico.

The best sites are located on estuaries or narrow inlets, where the tides reach the maximum range of forty to fifty feet. This facilitates the task of building dams containing watergates, and power plants. Because of the topography of certain sites, more than one dam can be constructed to impound a large body of water. This is the case with the existing tidal power plant in Brittany, France and the proposed plant on the Bay of Fundy.

The world's first tidal power plant was constructed by France in 1961. It is located at the mouth of the Rance River in the Gulf of St. Malo, Brittany. The project went in operation in 1966, utilising the tidal range of upto forty-four feet, to generate electricity. Today there exists a controversy with regard to the economic viability of the project.

NUCLEAR POWER

Uranium is the main source of atomic energy. It is found throughout the world but only in few ores is its concentration great enough to allow production. The richest uranium ore is pitchblende. The two most famous deposits are in Zaire and Great Bear Lake in Northern Canada. These areas were the only major producers before World War II. Carnotite is the most common ore in this country.

World Production

The United States produces almost one-third of world's Uranium. If we add the production of Canada and South Africa

the total comes to about 60% of the world's Uranium production. As the demand for Uranium increases, other ores will be utilised and the list of producing nations can be expected to expand.

In the United States, the major deposits are found in a belt extending from Arizona and New Mexico to Montana. New Mexico is the leading state, producing more than twice as much as the second state. The ores are not especially rich but large-scale production techniques keep cost relatively low.

TABLE VIII

Major World Reserves of Uranium, 1965

Country		Tons of U_3O_8 (An oxide that contain 84.8% Uranium)
1. Canada	...	200,000
2. United States	...	150,000
3. Republic of South Africa	...	140,000
4. France	...	35,000
5. Other nations (excluding Communist)	...	50,000
Total	...	575,000

In Canada, the deposits lie in a broad belt extending from Central Canada near the Arctic Circle to Ontario. Ontario is the leading producer in Canada with about 75% of the Canada's total production. In Zaire the Shinkholobwe mines used to produce almost pure pitchblende, but they have just exhausted these ores and are now mining lower grade ores. In South Africa, the Uranium is a by-product of gold mining industry.

The nuclear energy production by various countries for the year 1974 reveals the fact that the United States ranks first. This is followed by Britain, Japan and France.

TABLE IX

Production of Nuclear Energy, 1974
(Million KWh)

	Country		Production
1.	United States	...	112,696
2.	Britain	...	33,617
3.	Japan	...	19,699
4.	France	...	13,932
5.	Canada	...	13,863
6.	West Germany	...	12,136
7.	Soviet Union	...	8,000

The United States, Canada, South Africa and Congo produce Uranium, whereas India and Brazil produce Thorium. Presently India is also one of the important nuclear power nations of the world.

Unlike coal or oil, Uranium does not possess an inherent ability to be directly used by man because of its low concentration in the ore. Hence, it must be processed to concentrate the desirable elements into what is called a nuclear fuel. This fuel is composed of a mixture of U-235 and U-238 packed as Uranium oxide pellets into rods made from stainless steel or Zircon alloy. These rods are about one-half inch in diameter and upto fourteen feet long. Many of the rods are put together to form sub-assembly and several sub-assemblies are spaced close enough together in the reactor to sustain a chain reaction. One reactor may contain hundreds of thousands of pounds of Uranium oxide.

There are two processes practised to produce nuclear energy. They are (1) Nuclear fission process and (2) Nuclear Fusion process.

The nuclear power plants in operation today obtain their energy by fission process. This takes place within the reactor vessel at a carefully regulated rate.

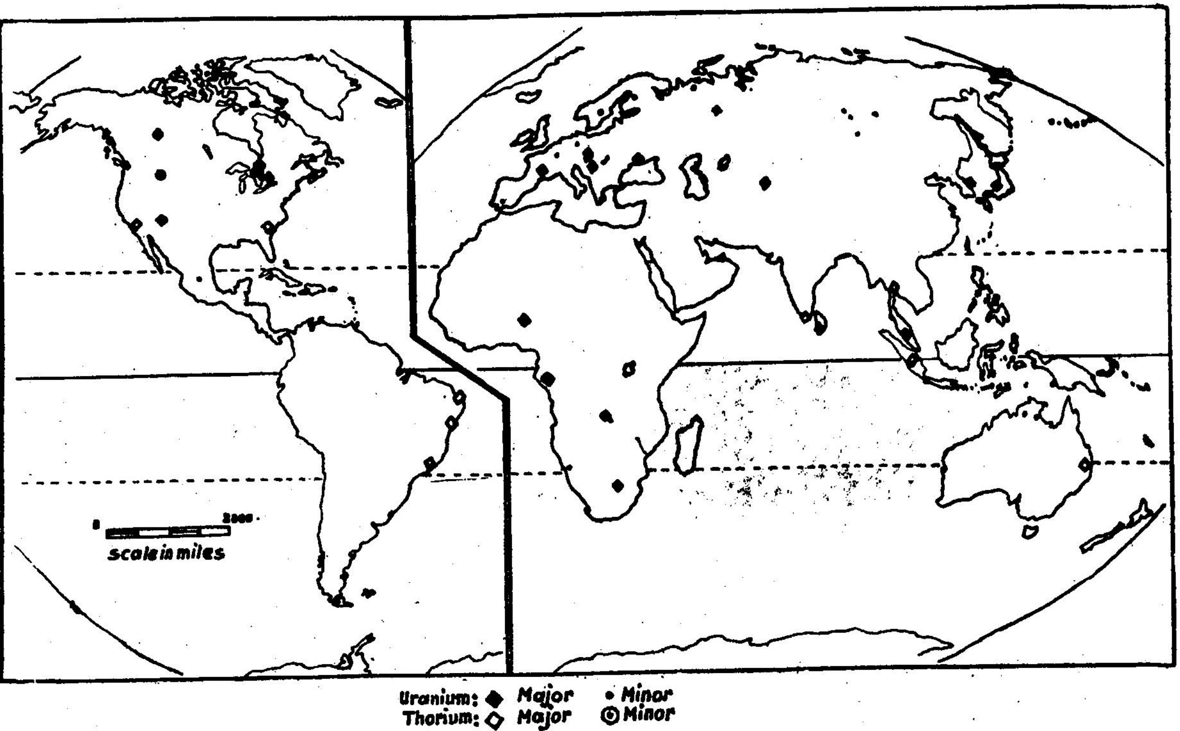


FIG. 5.12 World Distribution of Uranium and Thorium Reserves and Distribution

GEOTHERMAL POWER

For centuries man has used geothermal energy in one form or another. Perhaps the earliest was at hot water spas in Europe and Asia. People frequent such spas, which are still in use today, to soke in the hot water or to take hot mud bath. Since 1925, in Iceland hot water has been piped into homes and other buildings to furnish heat during long winters. In the United States, millions of tourists over the past century have visited Yellowstone National Park to see Old Faithful errupt on schedule.

Types of Geothermal Power Resources

There are three types of geothermal resources, steam, hot water and hot rocks. The steam resources can be subdivided into dry and wet steam deposits. The majority of such deposits are wet. Dry steam is preferred because it can be used directly. And therefore it is less costly to develop. Further, this leaves no deposits or minerals or salts. Wet steam must be separated into steam and water, before use. In New Zealand, this water is simply dumped into the streams, but in areas such as the Salton Sea in California, a high percentage of dissolved solids prevents such disposal. As a result most plants for geothermal power plants will include provision for responsible disposal of the mineral-laden water by reinjection, or treatment, for the removal of minerals, thus providing water for industrial, municipal and agricultural use.

Hot water is simply ground water which has come into contact with hot rocks beneath the surface of the earth. This water contains varying amount of dissolved solids, mainly salts, which must be disposed of in some manner.. The alternative seems to be to sell them for commercial use when possible, or to pump the solids, dissolved in a new solution, back into the ground for recirculation.

Hot rocks can be found at varying depths anywhere beneath the surface of the earth. Such geothermal heat is produced by the decay of radioactive materials. The heat radiates and is conducted towards the surface of the earth, thus explaining why temperature increases as one drills a well or descends into a mine. What appears to have the greater potential, are really the hot spots, often located

in a region containing relatively recent intrusion of molten rock magma into the mantle, but not extruding out into the surface. Such formations are sometimes indicated by the presence of hot springs in the surface. It has been estimated that temperatures of 572°F can be found within 6000 metres of the surface in much of the western United States.

Development

Electricity is currently produced commercially using geothermal energy in a few countries, while several other nations are engaging in active research. The oldest such installation is located in Larderello in the Province of Tuscuny, south-west of Florence, Italy. This dry steam field first generated electricity in 1904. It is still expanding and today it has almost 400,000 kilowatts of installed capacity. In 1950, Wairakei field in New Zealand was developed to produce electricity and supplement the country's major source of electricity, water power. In the United States, only one site has been developed, although prospecting continues for new sites in the south-west. In 1922, geothermal deposits at the Geysers, located eighty-five miles north of San Francisco, California, was tapped. There was sufficient pressure and temperature in the dry steam deposit to operate a turbine, but it corroded the pipes then in use. With the abundance of cheap hydro-electricity on the West Coast, it could not compete and the project was abandoned. In 1956, interest in the project was revived with the result that four investor-owned companies joined forces to tap this resource. Union Oil Company of San Francisco, and Magma Power Company of Los Angeles, California. In 1960, the first power plant rated 12,500 KW. By 1968, the installed capacity was 82,500 KW; with more than 600,000 KW projected for 1975.

Reserves

Estimating the amount of geothermal reserves of the United States about 30 million kilowatts are just in the West. Others now indicate that The Geysers and Imperial Valley may eventually yield 40 million kilowatts. The other nations in the world may turn their attention to their geothermal resources and develop them, using the experience gained in Italy, New Zealand, the United States and Mexico.

A major problem of natural steam wells is the noise. Technological developments will most certainly provide a solution to this noise problem. Present plants are located in remote areas, and thus, present no immediate problem. The dissolved solids in the steam and water, when separated, can create a disposal problem. The release of these solids could contaminate water supplies and watersheds, if not controlled. By removing the resources from the earth the surface may lead to subsidence problem at geothermal plants.

WIND POWER

Wind has been exploited by man for centuries; most notably to power his ships across lakes, seas and oceans. The wind represents an important energy source to man, but because of certain characteristics its use has been diminished during the past century. This is because of the competition from other more efficient machinery. The two great disadvantages of wind power are the variability of wind speed and weight of various wind machines. The appartus could not operate unless a certain minimum wind speed is available.

The most widespread use of wind power has been for sailing. Wind can be somewhat tapped by a variety of materials that can be made into sail. The size, shape and number of sails determined the amount of energy which could be used to drive a ship. But here also it has to face the problem of wind speed and wind direction.

The second most widespread use of wind power was in the construction of wind mill. These installations could be used to grind grain into flour, saw wood or pump water. This is very popular in Netherlands. But the diesel engines have driven the wind mills from the scene. Only a few mills are kept as a show piece for attracting the tourists. In the Yucaton peninsula thousands of functional wind mills thus far withstood the challenge of the diesel engine.

The successful development of wind power today depends on the availability of technology which would allow for the development of greater horse power, from a given wind speed. It now

appears that few parts of the world have sufficiently strong winds which blow enough days of the year to justify the development of wind power for that region. Perhaps the trade wind belt, with wind speed which average 15 to 20 KMP offer greatest potential.

The Consumption of Energy

As indicated earlier (chapter) the energy consumption of a country is an indicator of the level of economic development and the standard of living in the country. So the prosperity of a country very much relies upon the amount of the consumption of energy. The consumption of energy in the world increases every year. This is due to the larger, ever growing population and increased demand for energy for a constantly widening variety of uses. Over a period of time, the exact form and type of energy consumed may change due to the factors like availability, use, technology and price.

In 1969, petroleum was the favourite source of all energy consumed in the world. Recent estimates indicate that its share of the market has increased to 54% with coal declining to 2.7%.

TABLE X

World Energy Consumption by Fuel Type, 1969
(Million tons of coal equivalent)

Fuel Type		Amount	Percentage
Coal	...	2,563	36
Petroleum	...	3,015	42
Natural Gas	...	1,438	20
Hydro and Nuclear Electricity	...	163	2
World Total	...	7,179	100%

A major reason for the shift to oil has been the passage of legislation, to protect the environment. One of the simplest and quickest ways to meet such new regulations was by substituting petroleum products for the tens of millions of tons of coal that otherwise would be burned. This has improved the quality of air in big cities. This brought about the increased use of petroleum

products, which were easy to obtain and use to meet the energy requirements of that city.

The United States is the world's leading consumer of petroleum, using almost one-third of the total production.

TABLE XI

World Oil Consumption, 1969

Country or Region		Percentage of World Total
United States	...	32
Canada	...	3
Mexico	...	1
Caribbean including Venezuela	...	2
Other Western Hemisphere	...	3
Total Western Hemisphere	...	41
Belgium-Luxumberg	...	1
Netherlands	...	2
France	...	4
West Germany	...	6
Italy	...	4
United Kingdom	...	5
Sweden	...	2
Other Western Europe	...	4
Total Western Europe	...	28
Middle East	...	2
Africa	...	2
South Asia	...	1
South East Asia	...	2
Japan	...	8
Australia	...	1
Soviet Union, Eastern Europe & China	...	15
Total Eastern Hemisphere	...	31

By including oil consumption in Western Europe, almost two-thirds of the consumption is accounted. Many countries are turning to oil to meet their energy demand, and this helps to push the total amount of oil consumed even higher. Japan illustrates this situation, for her coal and hydro-electric power have proved inadequate to meet the energy demands that have accompanied her phenomenal economic development of the past two decades. Japan, therefore, turned to oil which is imported from Persian Gulf Region.

Now the natural gas consumption has greatly increased, especially in recent years. For example, during the period 1959—1969 natural gas increased its share of the world energy market from 14 to 20 per cent. This can be explained by its increased availability, minimal effect on the environment and lower cost. In many nations the demand greatly exceeds the supply, and the world is just now witnessing the construction of facilities which will liquefy more natural gas around the world to waiting markets, first as the oil industry has been doing for years.

During the decade of the 1970s, the consumption of electricity is expected to equal the amount consumed from the beginning of electric power industry in the 1880s, through the end of 1969. There is the increased preference for electricity in industrial, commercial and residential applications which once were met by such energy sources, as coal, manufactured gas, or water power. This shows the popularity of electricity. The world's preference for electricity continues to increase, while the primary energy mix used to produce this electricity has changed over time and is expected to show distinct shift by 1990. For example, in 1970, 46% of the electric power generated in the United States was produced by coal, 25% by natural gas, 12% by petroleum products, 15% by water power and almost 2% by nuclear energy. In 1990, it is predicted that almost half of the electricity produced will be generated by nuclear power, coal will produce 21%, natural gas 14%, petroleum products 9%, and water power 7%. This is based on the projected installed capacity of nuclear power plants in 1976 (shown in table).

TABLE XII

Projected Installed Capacity of Nuclear Power Plants in 1976

Country		Number of Reactors	Total Power Capacity (Megawatts)
United States	...	107	76,500
United Kingdom	...	42	13,300
West Germany	...	25	10,000
Japan	...	19	9,500
Soviet Union	...	29	8,800
Sweden	...	10	5,400
Canada	...	9	4,000
France	...	11	3,000

Nuclear moratoriums may prevent a wide application of nuclear generation, and new sources, such as solar and geothermal installations may contribute in a significant way.

Even though the United States produce electricity more than twice as much as other nations it ranks third in per capita consumption of electricity. Norway's prominent position in first place is due to the metallurgical industries located along the northern coast. Because of their large demands for electricity, and Norway's relatively small total population, the per capita consumption for this country is very large. But in a real sense, the per capita consumption by private individuals is not very great.

Regional Consumption

World energy consumption is dominated by two regions—North America and Soviet Union and its satellite nations—with a combined total of 65% of the energy consumed in 1969. By adding the 19% consumed by Western Europe, these three regions account for 84%. Thus less than one-third of the world's population used 84% of all energy consumed in 1969.

TABLE XIII

World Consumption of Electricity, 1970

(Quantities in thousand million Kilowatt hours and in Kilowatt hours per capita)

Country		Total Consumption	Consumption per capita
1. United States	...	1,640,264	8,009
2. Soviet Union	...	735,626	3,030
3. Japan	...	350,590	3,391
4. West Germany	...	250,363	4,067
5. United Kingdom	...	249,222	4,464
6. Canada	...	201,300	9,404
7. France	...	140,209	2,759
8. Italy	...	121,388	2,262
9. China	...	93,554	121
10. East Germany	...	68,052	3,943
11. Sweden	...	64,703	8,042
12. Norway	...	56,770	14,635
13. Australia	...	56,153	4,474
14. Czechoslovakia	...	49,368	3,412
15. Netherlands	...	40,518	3,110
16. Belgium-Luxumberg	...	34,591	3,454
17. Switzerland	...	28,413	4,509
18. Finland	...	23,078	4,915
19. New Zealand	...	13,815	4,916
20. Others	...	694,129	—
World Total	...	4,912,106	92,917

International Trade

North America, Western Europe, and Far East were net importers of energy in 1969. That means that Latin America, Western

Asia, and Soviet Union and its satellite nations were the net exporters of energy, mainly due to the surplus production of petroleum. However, smaller regions and individual may depart from such broad generalisations.

Future Demands for Energy

It appears that the advanced nations cannot continue to consume such a majority of the total energy each year, if the level of living is to be increased in the underdeveloped nations around the world Certainly more energy will be needed by the world, but a larger percentage of this will have to be consumed by the developing and underdeveloped nations. There exists evidence which supports the notion that higher the consumption of energy per capita, the more advanced is the economy of the nation. Therefore, energy in one form or another will be applied to improve opportunities for progress around the world.

TABLE XIV

World Energy Production and Consumption, 1970

(Quantities in Million tons of coal equivalent)

Region		Production of Total Energy	Consumption of Total Energy
World	...	7,699	7,521
Africa	...	496	119
North America	...	2,486	2,719
Latin America	...	470	281
Far East	...	259	578
Middle East	...	1,035	85
Centrally Planned Asia	...	471	484
Centrally Planned Europe	...	1,793	1,687
Western Europe	...	612	1,487
Oceania	...	78	85

One avenue of attack is simply to find more of the traditional energy sources by digging more coal and finding more oil and natural gas. Although tremendous amounts of these fuels lie yet to be discovered, the scope of needed supplies is challenging indeed.

A second avenue is to develop nuclear energy. This includes locating new sources of uranium and investigating in large nuclear power plants to reduce costs of fission generation, along with the perfection of more advanced technologies such as fusion and breeder reactor.

A third avenue which should be thought of as a supplementary source is the development of new energy sources such as solar and geothermal power. Given technological breakthrough, wind and tidal power could also contribute energy to some regions.

Conservation of Energy

An avenue of attack that can have an immediate effect on the energy situation is along the line of conserving energy. The developed countries have developed a way of life based upon the abundance and low cost energy, and the present shortages and the increasing cost of energy are altering to the need to do things differently.

In many buildings of today, the style has been greatly influenced by a device for minimum maintenance and maximum protection against vandalism. Thus, many schools and other public buildings are relying on more electric lighting and air-conditioning to create a pleasant indoor environment while eliminating the windows of yesterday which let in fresh air and light. This trend demands more energy.

As a form of advertisement many commercial buildings are constructed with glass. This requires the use of much glass, and glass is a notoriously poor insulator. In winter, tremendous amount of energy is lost to the atmosphere from houses and other buildings featuring sliding glass doors, huge glass windows, and insufficient insulation. It is also a known fact that winter heating and summer cooling costs can be reduced by siting a house with

proper consideration for prevailing winter winds or the directions of the rays of the summer sun.

A major cause of the electrical brownouts, and blackouts during the summer months is the widespread popularity of air conditioning. The second for shortage of energy supply is the use of automobiles especially big cars which consume more fuel than small cars. Faster travel speeds on streets and highways have demanded levels of illumination at intersections and other busy sections of the nation's highway, to enable the drivers to see for enough ahead in order to properly control their vehicles. Again this means more of energy consumption. The use of electric lights to advertise a place of business has long been an accepted practice in most part of the world. In some cities, the fabulous variety, design and number of illuminated signs might even be considered excessive, as in Los Vegas, Neveda, or in Ginza district in Tokyo. It is hoped that this present energy shortage will encourage the adoption of smaller signs needing less energy. Not only it will save business money but also reduce the demand for energy.

An endless list of electrical appliances used in homes for convenience consumes lot of energy.

The present situation suggests the need for a revaluation of our energy resource and our energy uses. It is most important to find ways to reduce the rate of consumption increase. The final solution to energy conservation is that the people should realise the energy situation and they themselves should reduce energy consumption without speculation about prestige.

CHAPTER VI

INDUSTRIES

Man's dependence on the industry has grown manifold. His comforts and (in certain extent) all his basic needs are associated with industrial products. Our forefathers depended on animal driven lift irrigation and green manures for agricultural production. But in the past decades or centuries our population has grown to too many numbers; hence we cannot depend on age-old practices. We make use of pumpsets, chemical fertilizers and pesticides for today's requirements in agriculture. These are all products of industries. Terraced houses we build; multi-storeyed buildings are constructed for our multi-activity uses. In these processes we consume large quantities of cement and iron and steel. Cement and iron and steel industries meet our needs. Therefore our basic needs of food and shelter, in the present day world cannot be met without the influence of industries.

Without our textile mills it may not be possible to meet the cloth requirements of our people. We would have not dreamt of giving education to all people if paper production and printing had not been done by industries. Radio, T.V., Fans, Medicines, and Cosmetics are the products of industries. We make use of cycle or bus to attend our everyday activities like, attending school, going to office and visiting markets; the travel modes are products of industries. Therefore our quality of life, comforts in living conditions, recreation and above all, our happiness in life depend on factories and their products. Industries give employment to millions. But for the industries these people would have not found any other job in agricultural lands and administrative establishments. In short, industries are integral part of our life; they provide food and shelter, comforts and happiness, jobs and recreation.

Industrial Activity

Most of the resources are of no practical value in their individual form. Mineral resources have to be converted as metals and

chemicals to find practical value. Road and rail line development as resource will not be of any commercial value if automobiles are not there to run on the transportation lines. Therefore industries are the establishments which make the things (resources) usable.

Industries basically conduct *manufacturing activities.* The establishment that transforms raw material to a finished (or semi-finished) product is called a *factory*. Sometimes to mean a factory synonymous words are used. For instance Mill is used to mean a cotton textile factory (Textile mills). The word industry is also used to mean factory; iron-processing and steel making unit is called an iron and steel industry. Factories conduct two sets of activities:

(*a*) Factories change the form or upgrade the quality of the basic resources by processing in which resources become useful or more useful. Agricultural products like wheat, tea leaves and sugar-cane are *upgraded* as flour, tea and sugar by which they become *more useful.* Minerals are *changed* from their *form* as metals and chemicals by which minerals-become *useful.*

(*b*) Factories *assemble* semi-finished products into final form. Car manufacturing, ship-building and fertilizer manufacturing are the examples of assembling units.

By conducting these sets of activities, factories serve as links between the source regions of raw materials and market regions where the products—are consumed.

Industrial Geography

Geographic studies on industries can be organised through several types. Very basical of all the types is the *Locational aspects of industries.* The location relationship may be, for some industries, with raw materials. The sugar factories, iron and steel industries, aluminium production etc. are raw material oriented. Landforms such as natural deep water harbour facility, may be an important factor for the location of ship-building industry. Tc locate an electronics industry, we need very skilled persons of electronics. In general locational aspects are many; it can be divided as physical factors and socio-cultural factors. Sometimes

only one factor may be the dominating aspect for the location of industry. In certain other cases, various locational factors operate in combination and that complex criteria may influence the site selection.

The *distribution of industries* will bring out spatial or areal variations. The distribution of a single industrial activity will bring out its patterns of distribution and underlying factors for the distribution. For example when a study on the distribution of sugar mills is made, we learn the nature of distribution; we understand that particular climate and soils influence the sugar-cane cultivation and in turn sugar-cane producing areas influence the sugar mills. This will, further, bring out surplus regions and deficit/demand regions of this industrial product. Same as the case that the study of ship-building industry in the world directs our attention towards the various countries and their harbours.

The distribution and development of the industries are political boundary oriented. Different types of governments and their industrial policy will bring out different patterns of industries within their administrative areas. Therefore the *Regional Study of Industries* will help us to understand in a regional level. Continent by continent; country by country; state (country) by state regions vary. Therefore the regional study of industries may explain the nature of distribution in a state or a country; or may be restricted to a small district or a metropolitan town. The study of industries in Tamilnadu, industries in U.S.A., industries in Madurai Metropolitan area are of these kinds.

But the minerals and agricultural practices cross the political boundaries. Iron-ore and coal deposits in Chota-Nagpur region cover areas in Bengal, Bihar, Orissa and Madhya Pradesh. Sugar-cane producing regions of Tamilnadu in Tiruchi, Thanjavur and South Arcot districts cross the Administrative boundaries. Therefore industrial activity crosses the political boundaries wherever it is possible. Certain areas irrespective of administrative and political boundaries are rich in raw materials. Coimbatore metropolitan and surrounding regions is one such region; where cotton textiles and engineering industries are developed and in certain extent cement, sugar, electronics and food processing industries

are developed. The concentration of industrial activity separates an area as an industrial region from the surrounding areas. The study of such *industrial regions* or manufacturing regions, therefore focusses our attention towards the concentration of industrial activity in a region, where several (or same) types of industries compose the industrial complex and associations relating to it will be of geographical interest.

There is no doubt that locational aspects influence the location of industries; but after the establishment of the industry it will become a factor to the surrounding regions. Our industries modified the pattern of our education; Engineering, electronics, town planning, industrial architecture and management were the new branches of studies opened in the universities in the past 100 or 150 years. We adjust our living conditions with industrial wastes (Pollutions: Smoke, noise, water contamination, etc.). The *impact of industries* over the surrounding regions or on the community will be of practical use to reduce problems of industries. *Industrial impact on environment* is a growing region of study in which scientists try to understand the relationships of industrial activity with other activities.

Factors of Industrial Location

In considering the locational factors in industrial geography, the term can be applied to any phenomenon that influences the location of a factory.

The physical factors were the major factors of industrial location during the beginning of industrial revolution. But today, physical factors do not play a much considerable role on the location of industries. Some of the physical factors which influence the industries are climate, water supply and land form characteristics. Aircraft manufacturing industry requires vast area of levelled land and comparatively a clear sky throughout the year. Therefore locating this industry in Kashmir like region has limitations. Paper mills consume large quantities of water for washing and cooking purposes. Location of paper mill near freshwater source is inevitable. Ship-building industry cannot be located at Madurai; it requires a deep water harbour facility. Therefore, physical

factors still play a dominant role in the location of some of the industries. Availability of basic raw material is also related to physical factors. Mineral deposits are associated with geologic formations; agricultural raw materials are largely associated with climatic and soil conditions.

Socio-cultural factors are the results of development Quality and Quantity of labour force, consumer areas (Markets), industrial know-how, capital availability, types of government, and transportation development are the major components of socio-cultural factors of industrial location.

Labour supply is a must for industrial enterprise. Technically sound and scientifically advanced labour force is a pre-requisite for electronics and chemical industries; without the transportation development raw materials cannot be moved to industrial sites, and industrial products to the markets. If products are not able to find markets, industrial production has no value at all.

Therefore a number of favourable factors operate as a factor for the location of an industry. If advantageous factors are more than negative factors then that may be the optimal site for the location of an industry. A single location having all factors as favourable is seldom available.

In the order of their importance the following factors can be considered as major factors of location. They are:

(*a*) Availability or supply of raw material.
(*b*) Supply of power and/or fuel,
(*c*) Market facility,
(*d*) Labour force,
(*e*) Transportation.
(*f*) Capital.

The other minor factors include climate, water supply, waste disposal facility, tax policy and government incentives.

Raw Material

Two groups of industries are mostly raw material oriented: Firstly, the industries which require large quantities of raw materials

and comparatively produce lesser quantity of finished products are located near the raw material regions. Ore smelting industries are primarily of this kind, *e.g.* iron and steel smelting aluminium concentration plants, coke making units, etc.; sugar mills and tea processing units are also of these kinds. Secondly, the industries which use perishable raw materials are located near the raw material source. Dairying plants and fruit canning plants are examples of these categories.

Power and/or Fuel Supply

Metallurgical and chemical units consume tremendous quantities of power. Aluminium is separated by electrolysis method. In chemical industries automation is inevitable. Automation requires considerable amount of power supply. Therefore chemical industries are located at the power supply centres. For the production of steel, metals, and cement, coal is one of the ingredients (fuel). If production centres of these types are located at the fuel supply spot, considerable amount in production cost can be reduced. Glass manufacturing includes fuel costs. Supply of large quantity of fuel is, therefore, a pre-requisite for this industry.

Markets

Newspapers should reach the people at the earliest times. If a Tamil newspaper publishing unit is located at New Delhi, then by the time it reaches different parts of Tamilnadu, the news it contains will be no more 'news'. Therefore newspaper printing, bottling of soft drinks and bakery products are usually market oriented. Products like furniture, and packaging materials (wooden box, metal box etc.) occupy a larger space when finished products are made. Then transporting these materials to markets involves additional costs. In circumstances like this the assembling units of these types will find a location near the markets. Locating glass and tile manufacturing industries near the market considerably reduces 'risks'.

Considerable portion of manufacturing is not depending upon local markets as explained above. Then products will be manufactured for the regional or national markets. Sarees and dothies

are manufactured for our regional and national markets. Sometimes the market may be international market. Our tea production is always oriented to international marketing in tea.

Labour Supply

The growth and future of any industrial activity is always associated with labour supply. The continuance in the supply, diversified quality and considerable lower cost of labour are advantageous for industrial location. The cost of living in metropolitan centres is generally higher. The labourers in the larger towns expect higher wages than in smaller towns and villages. The industries which use less number of skilled persons if located at small towns and villages may be more profitable. Industries like ship-building require diversified work force which ranges from painters, welders, carpenters, structural engineers, electrical engineers to designers and management specialists. Then diversified labour supply region with a good harbour is of greater advantage for the location of ship-building activity.

Transportation

Transport is generally defined as the life blood of trade and industries. The influence of transportation as a localising factor is evident in every modern manufacturing concentration. In India major manufacturing centres are major transportation convergence points. Bombay, Calcutta and Madras are major air, sea, road and rail connection centres and major manufacturing centres. Most of the large scale manufacturing activities of Tamilnadu occur along the railway line. Railway is able to transport raw materials (even bulky ones), finished products and construction equipment at a lower cost over the land.

Products like sensitive (heat) medicines and flowers need quicker modes of transportation to the markets. The transportation of soft drinks from factories needs more efficient transportation; hence trucks are more appropriate.

Capital

Capital was a major factor in the beginning of an industry. Now-a-days capital is a mobile one. But to organise a large amount

of capital is a major problem. The location of iron and steel factory at Salem and Hospet is not achieved as planned as it involves mobilisation of millions of rupees of investment. When industrial activity is large scale oriented then capital acts as a major locational factor.

Other Factors

Already we have noticed the importance of climatic conditions and water facility for the location of certain industries. Apart from this government can play a decisive role in the establishment of manufacturing. The ship-building, locomotive and rail coaches manufacturing, and air-craft manufacturing are controlled in India by government. Likewise large scale industries are highly controlled by our government. Likewise tax policy of each state government varies in India. However, taxes increase the total cost of the products, by which the number of items sold in the market have limitations. Tax reductions and tax exemptions attract industries which produce costly goods.

Principal Industries

Classification of industries into groups is of academic interest; but attempting it has restrictions. There is no international system of classification available for this purpose. Ranking industries according to their 'value' and classifying them is also impractical; because the value of the industries varies from one type to other types. Some industries give more employment; but some other industries earn more money; the third kind may be indispensable for the economic well-being of the people. Therefore classification of industries is a very difficult subject. However, for our understanding of the basic types of industries we can divide them into four groups. They are:

1. *Mineral Based Metallic Industries*

Metal production is the end function of these groups of industries. These industries produce all kinds of metals. Metals are having indispensable application in all manufacturing activities. How-

ever, based on their quality and prime use metallic industries fall under three types.

(*a*) *Iron and steel* industry is by far the important group of this category. The economic strength of a country is associated with the production of iron and steel.

(*b*) *Ferro-alloy metals* are alloyed with steel to impart certain properties to steel; steels that are resistant to abrasion, shock, fatigue, corrotion, high temperature and withstanding heavy loads, high speed and friction arc resultants of alloy technology.

(*c*) The third type of metals are called *non-ferrous metals* which include *heavy metals* such as copper, lead, zinc and tin and *light metals* such as aluminium, magnesium and titanium. Ncarly minerals of the non-ferrous metals are found in complex form; they need two or three steps of processing to get the final products. However-one strange aspect of the non-ferrous metals is that large part of them is mined in developing countries whereas the main consumers are industrially advanced countries. Except aluminium all the other non-ferrous metals are available in restricted proportions; therefore they are rapidly exhaustible.

2. *Non-metallic Mineral Based Industries*

Non-metallic minerals are used in the manufacture of various chemicals and construction materials. Non-metallic minerals are found in various rock deposits and marine deposit concentrations. The fuel minerals, such as coal and petroleum are also non-metallic minerals. But in trade parlance, other than fuels the non-metallic minerals are called 'industrial minerals' or 'non-metallics'. Many of the non-metallic minerals are abundant and cheap; their economic value is, therefore, felt very little. The 'metallics' vary in their major applications as follows:

(*a*) *Construction material manufacturing units*: Cement, glass, ceramics and refractories are manufactured by these units. Various minerals are associated with this group of industries:

Limestone, dolomite for cement.
Kyanite, Sillimanite, Magnesite for refractories.
Kyanite, Steatite for ceramics and tiles.
Silica sands, limestone for glass industries.

The products of these industries are used in the construction of commercial buildings, domestic housing, industrial construction, electrical and electronics waves and other varied applications.

(*b*) *Industrial chemical manufacturing units:* The industrial chemicals are otherwise called 'heavy' chemicals. These units are always very 'large' units and produce 'millions' of tons of products. These chemicals form basic raw materials for various consumer oriented chemical industries. Drug, dye, paint, synthetic fibre, leather-processing, metal refining, paper, soap, glass, fertilizers, explosives, detergents etc. These manufacturing industries depend upon industrial chemicals for their raw material supply.

The major industrial chemical units and the raw materials used in them are:

(i) Sulfuric acid plant ... uses sulphur.

(ii) Soda ash plant ... uses common salt (Sodium chloride).

(iii) Caustic soda plant ... uses salt.

(iv) Chlorine plant ... uses byproduct from caustic soda plant.

(v) Ammonia plant ... uses atmospheric nitrogen.

(vi) Nitric acid plant ... uses atmospheric nitrogen and rock deposits of salts.

(*c*) *The petro-chemical industries:* The petroleum refining or petro-chemical industries are primarily non-metallic mineral oriented industries. Petro-chemical industries are directly associated with supply of industrial, automobile and aviation fuels, drugs, fertilizers, various pesticides and herbicides, cosmetics, road construction materials and industrial rubber.

(*d*) *Fertilizer manufacturing units:* Even though fertilizer manufacturing is depending upon industrial chemicals and petroleum refining, there are certain rock salt deposits which supply raw materials for fertilizer manufacturing. Native phosphates, and apatites occur as natural rock formations which can be used for manufacturing fertilizers.

3. *Bio-Culture Based Industries*

Bio-culture based industries are mostly the results of urbanisation and cosmopolitan living. The food processing industries, for example, supply food items to the urban people in the form of canned foods or flour, sugar, oil, fish and dairy products; otherwise the growth of towns will be highly restricted. This kind of industrial development and product consumption are less, if the country is highly rural.

Agriculture, forests and animals also supply raw materials for :

(i) Textile industries,

(ii) Paper manufacturing and chemical manufacturing,

(iii) Leather goods manufacturing.

Most of the bio-culture industries are raw material oriented and involve two or three stage operations in manufacturing.

4. *Machine Manufacturing or Metal Fabricating Industries*

Machine manufacturing is by far the most important achievement of scientific development. This relieved man from time factors, muscular power, and subsistence level of living; man's time for thinking has increased due to the machines. The various industries of this group can be further classified as:

(*a*) *Machine tools manufacturing:* The products of these unite manufactured machines and machine components; some of them include lathes, drills, presses, planers, shaper, boring machines and threading machines. Machine tool manufacturing in fact, makes a country industrially dynamic and potential. The industrial power of a country is normally backed by its machine tool manufacturing.

(b) *Agricultural machine manufacturing:* Normally, the production of these machines is related to the industrial development, population density, and rural composition of people of a country. The developed countries and industrially advanced countries produce more farm machines than the agrarian countries and developing countries. Tractors, harvesters, thrashers and driers are some of the products of these units.

(*c*) *Construction machinery manufacturing:* Construction machines are used in mining activities, multi-storeyed building constructions, dam constructions and road constructions. Various cranes, conveyor belt units, crushers, drying equipments and mixing units are produced by these groups of industries. In India, for example the value of these machines in recent years is growing.

(*d*) *Transportation Equipment manufacturing:* The products of transportation machinery manufacturing units changed the life pattern of the people at different scales. The world has grown 'shorter' by distance. Bulk is carried from supply to distant demand points. Automobile manufacturing, ship-building, locomotive manufacturing and aircraft manufacturing are the major activities of this group.

(*e*) *Electrical machinery and Electronics manufacturing:* The installation of power production plants, transmission lines, radio and T.V. stations, and computer technology depend on electrical and electronics machinery units. The modern life style is, in certain extent, slave to this group of manufacturing activity. Industrial automation, electricity and our entertainment are highly associated to these industries.

From Fig 6.1, it may be noticed that some of the industries are oriented to bio-culture based as well as non-metallic mineral based raw materials. Chemicals, rubber, synthetic fibres, medicines, cosmetics and soaps and detergents are some of those which can be manufactured from both kind of raw materials.

The metallic and non-metallic mineral oriented industries, in general, are associated with raw material locations and technological developments. Capital and labour are secondary requirements. Machine manufacturing is always associated with skilled labourers, scientific and technological development, advancement in research and higher levels of urbanisation.

The agro-based industries are mostly labour oriented, raw material oriented and transportation oriented.

Distribution of Selected Major Industries

From our understanding of the industries and their types we are aware that studying the distribution of all the industries is

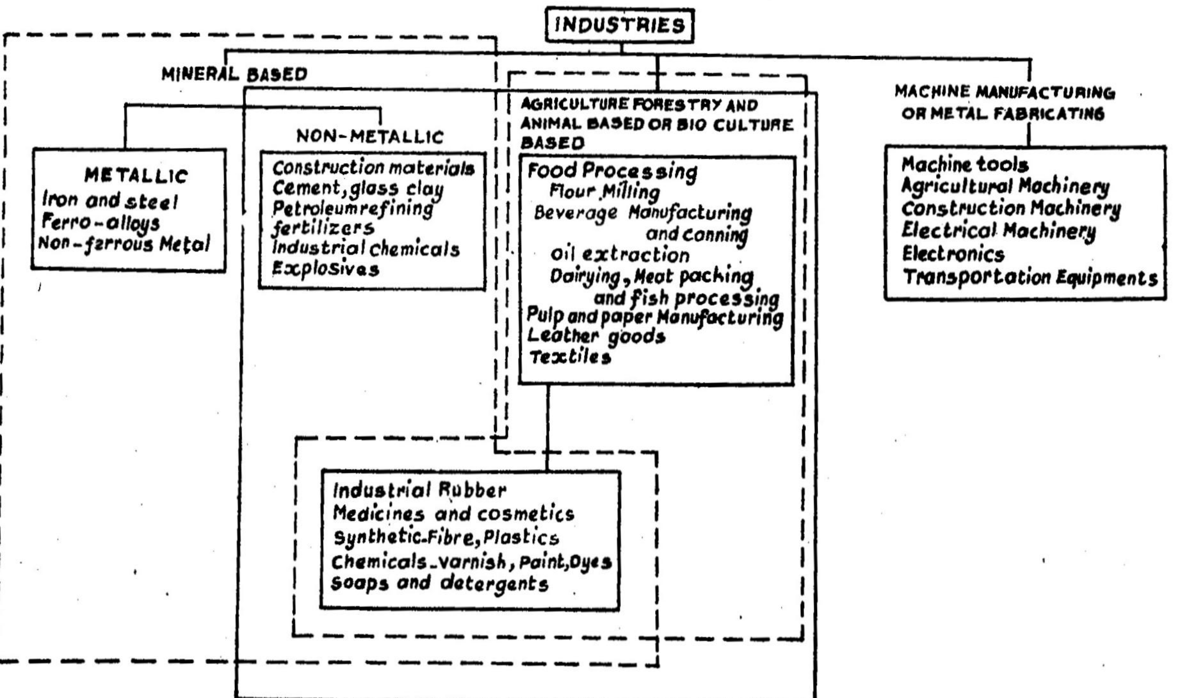


FIG. 6.1 Major Industrial Types

inexhaustive. However the study of selected industries can give us an overview of the industrial distribution pattern of the world. Based on this we are able to generalise the patterns of distribution of industries in the world.

1. *Iron and Steel Industry*

Steel is comparatively the cheapest and the most useful metal. In our daily life use of steel is inseparable. From domestic use as vessels, tools, containers etc., to transportation use as cars, ships, trains etc. and to industries and construction as steel structures, machines and machine tools, steel is more suitable and stronger for most of the purposes.

The iron and steel industry is primarily raw material oriented; iron-ore and coal are the two important raw materials required. Since the raw material is bulky and associated with 'weight loss' this factor is quite understandable. However, the increased production of steel changed the locational factor. Now market (*i.e.* industries that use steel as raw material) has become most important factor than the raw materials. Therefore, mostly 'concentration units' are located at the raw material site. This involves two to three stage production of steel.

First—concentration of iron ore ... at raw material site.

Second—pig iron production ... at the market site.

Third—special steel production unit ... at the market site.

The major distribution of iron and steel mills is found in Europe, U.S.A., Canada and Northern and Central parts of Asia (*i.e.* in countries like U.S.S.R., China, Japan and India). The following table (Table I) presents the position of crude steel production by the first 10 countries of the world.

Pittsburgh, Chicago, Pennsylvania in U.S.A.; the midlands, Yorkshire, South Wales and Scottish lowlands in U.K.; Ruhr and Saar in Germany; Lorraine in France; Luxemburg-Belgium; Urals, Donbass, Kusbass, and Ukraine in U.S.S.R.; Tokyo-Nagasaki in Japan and Chotanagpur region of India are some of the major concentration centres of iron and steel production.

TABLE I

Crude Steel Production

(in million metric tons)

Name of the Countries		Production in 1971	1975
U.S.S.R.	...	120	141
U.S.A.	...	109	106
Japan	...	89	102
West Germany	...	40	40
China	...	21	29
France	...	23	22
U.K.	...	24	20
India	...	6	8
South Africa	...	5	7
East Germany	...	5	6.5

2. *Aluminium Manufacturing*

Aluminium bearing minerals constitute about 8 to 9% of the earth's crest; aluminium has many of the good qualities of different metals; the additional advantage it has is its light weight. Aluminium production involves two stage operation.

(i) Bauxite to Alumina—which requires huge supply of Bauxite and water facilities.

(ii) Alumina to Aluminium—which requires larger amount of electricity.

Therefore aluminium manufacturing plants which are located near raw material are concentration units. Final products are manufactured at Aluminium plants at power supply and water

supply sites. Table II shows the pattern of distribution of the two stage production of Aluminium.

TABLE II

Aluminium Production—1974
(in million metric tons)

Bauxite (Alumina) Production			Aluminium Production		
Country	Amount	Per-cent to World Total	Country	Amount	Per-cent to World Total
Australia	19	24	U.S.A.	4.5	34
Jamaica	15	19.5	U.S.S.R.	1.5	11
Surinam	7	9	Japan	1.2	9
Guinea	7	8.5	Canada	1.0	8
U.S.S.R.	4	5.5	West Germany	0.7	5

The table lists the countries whose production are more than 5 percent to the total world production. It may be noticed that the location of alumina site is near raw materials and comparatively away from populated regions. Aluminium plants are in the industrialised regions.

3. *Cement Manufacturing*

Th cement is otherwise called portland cement. The product mad out of cement and sand that resembles a sand stone quarried on the Isle of Portland, England and thus it is named.

The manufacture of cement is again raw material oriented like the other mineral processing units. Supply of lime, silica and coal are essential for the plant. Particularly huge supply of lime is a primary factor. Therefore the cement plants are normally located at regions where abundant lime is available. This made the industry as local manufacturing. U.S.A., U.S.S.R., Great Britain, France, Germany, Japan and China are the major producing countries.

Particularly U.S.A. and Western Europe account about 70 to 75% of the total cement manufacturing. Among the developing countries India has a number of cement manufacturing plants.

4. *Textiles*

Textile manufacturing is one of the oldest and the most widespread industries of the world. It requires widespread markets, and labour supply for the location. Raw material can be imported since the weight loss of cotton is less significant. Because of these locational factors, the distribution is found in the raw material, labour abundant and market regions of the world. U.S.S.R., U.S.A., Western Europe, Japan, China and India are the leaders of cotton yarn and cotton textile producers (Table III). The manufacture of wool and man-made fibres such as Nylon, Rayon, Dacoron, Acetates and Fibre glass also follow the same distributional pattern.

TABLE III

Total Woven Cotton Textiles Production—1975

(in million metres)

Country		Production
India	...	8034
U.S.S.R.	...	7240
U.S.A.	...	3745
Japan	...	2124
U.K.	...	405
China	...	7500

5. *Chemicals*

Chemical industries mostly use raw materials of low value. Even though chemical production is highly associated with technology and scientific developments, certain branches of manufacturing are found widespread in the world. The locational aspects

are complicated and varied from region to region. Raw material requirements range from petroleum crude to salt, air, water, sulphur, vegetable stuffs, forest products etc. Therefore, depending upon the nature of chemical production the locational aspects and distributional pattern vary widely.

Table IV presents the picture about caustic soda and soda ash production in the world. From the table we come to know that Western Europe dominate in the production of basic chemicals.

TABLE IV

Basic Chemicals Production

(Production in '000 metric tons)

Caustic Soda	Country	Soda Ash
443	India	541
2861	Japan	1117
442	East Germany	818
2489	West Germany	1249
1120	France	1279
8410	U.S.A.	2534
2395	U.S.S.R.	4692

Industrial Regions

Many industrial activities are inter-related. Raw materials are shared. For example chemicals, sugar manufacturing and textile manufacturing use raw materials from agricultural production. Coal is a primary factor for iron and steel production, chemicals, cement and power production. Product of one industry becomes raw material for others. Iron and steel is associated with various metal fabricating units. Therefore, a number of industries tend to concentrate in the same manufacturing place or region. Because of this, number of units in manufacturing activities and labour force engaged in manufacturing are concentrated and given rise to industrial regions.

The concentration is more common near

(1) Coal fields and power supply regions,

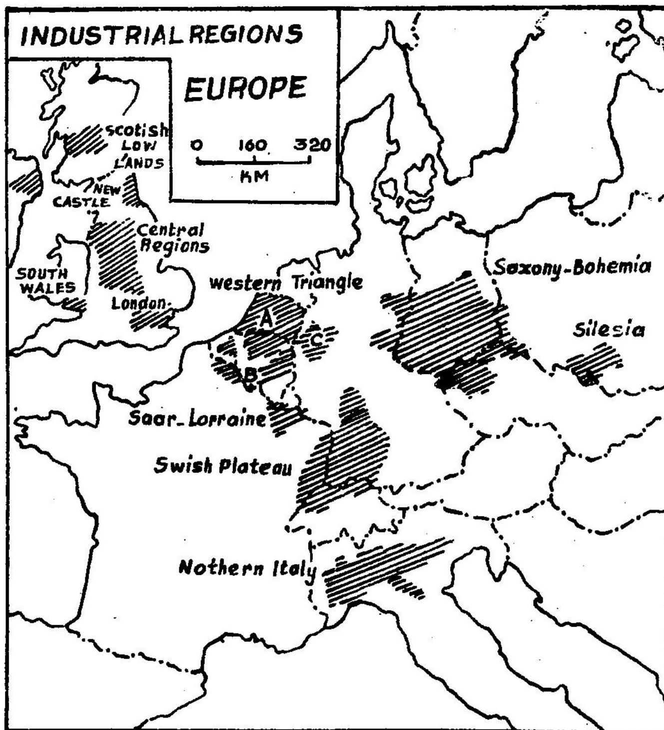
(2) Raw material sites,

(3) At ports which are having larger hinterlands,

(4) Population regions where labour supply and markets are assured,

(5) Transportation and scientific application are better developed.

Since the above said factors together are unevenly present in the world, the industrial regions are also unevenly distributed.



A-North France-Belgium B-Sambre-Cambine C-Rhur

FIG. 6.2

However, throughout the world coal mining centres, where industrial know-how is at an advanced level, have attracted many industries. Thus, it has given rise to manufacturing regions. Apart from this, markets and consumption regions, port regions and agriculturally rich regions have become industrial concentrations.

In Europe in industrial concentrations coal mining and markets are highly inter-related. Fig. 6.2 presents the picture of industrial concentrations in Europe. If we compare the map of coal mining regions of Europe, more or less this map is coincident to that. The advantage in Europe is that the centres are not far from ports.

Like Europe, North America is also well endowed with coal concentrations, markets and port facilities in certain regions of the continent. Therefore, these regions have become industrial concentrations. Apart from this, the forestry and commercial agriculture stimulated the growth of industrial concentrations to outside the coal regions. Fig 6.3 presents the details of Industrial Regions in North America.

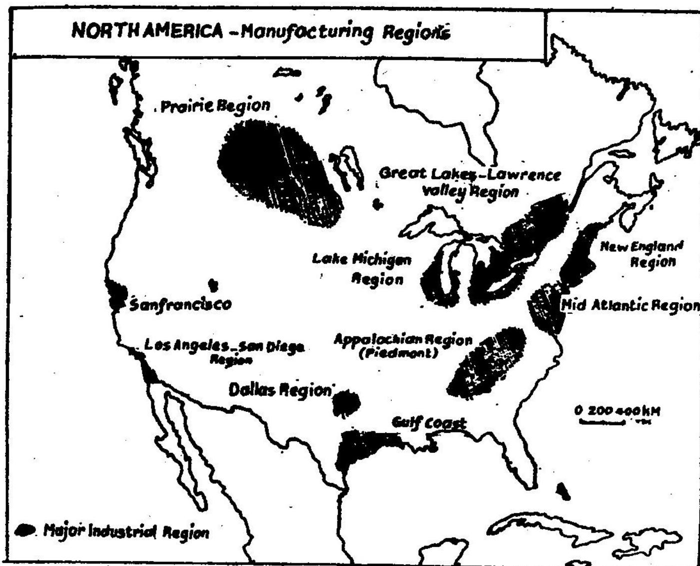


FIG. 6.3

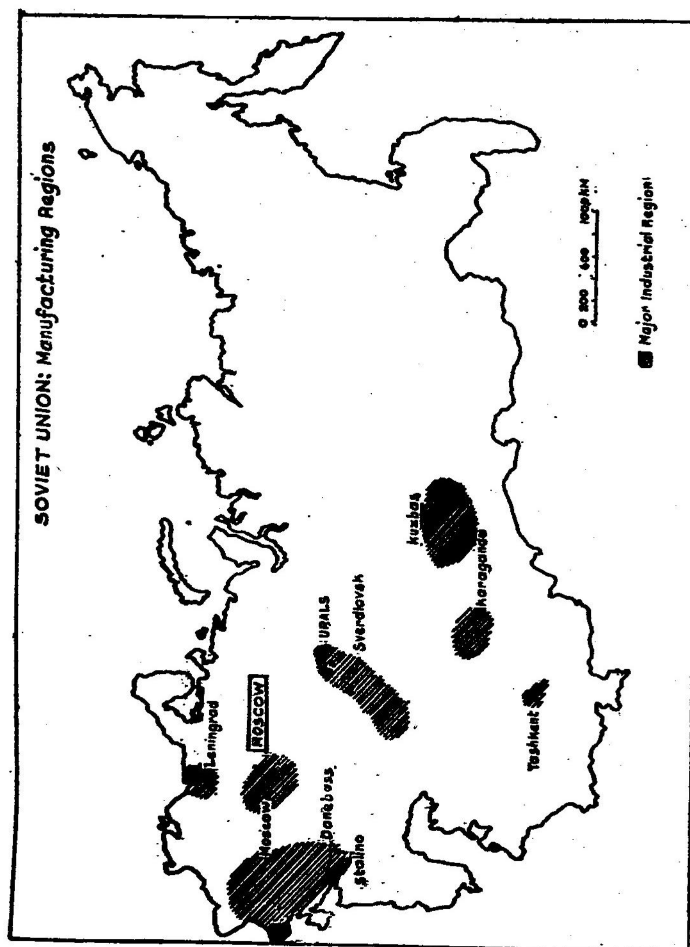

SOVIET UNION: Manufacturing Regions
Leningrad
MOSCOW
Moscow
Donbass
Stalino
URALS
Sverdlovsk
Kuzbas
Karaganda
Tashkent
Major Industrial Region

FIG. 6.4

In U.S.S.R., except the Leningrad region all the other industrial regions are synonymous to coal concentrations (Fig. 6.4). Another important aspect is that except Leningrad and Donbas region all these regions are away from the ports.

In Japan the important industrial districts are the Kobe-Osaka, Nagoya and Kwanto plains districts. These districts are associated with port facilities, forests and higher technical know-how. The primary important factors like coal abundance, and local huge

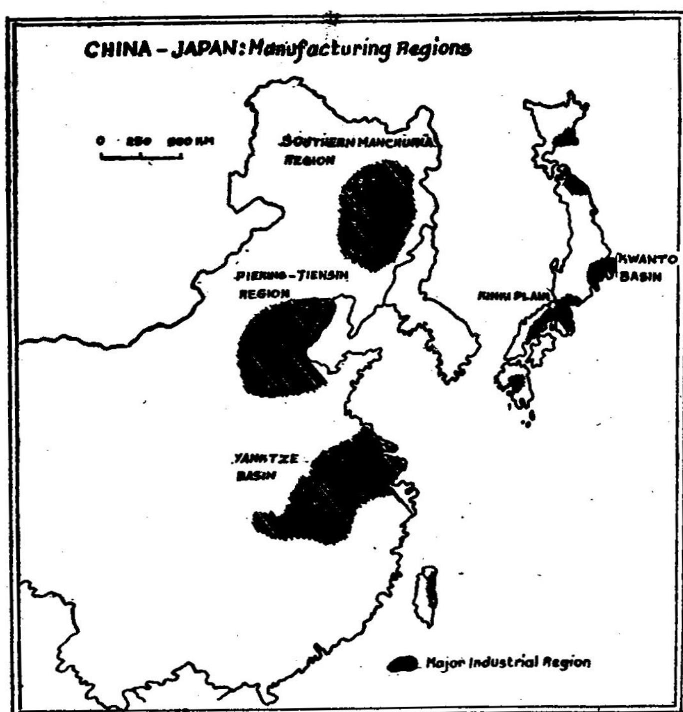


FIG. 6.5

markets are absent (Fig. 6.5). In China again the coal mining is synonymous to industrial regions.

In India industrial activity is mostly attracted by large and old cities. The labour supply is mostly associated with industrial development. Apart from this, better agricultural hinterlands

have given rise to industrial concentrations by the supply of cotton, sugar-cane, hides and skins, and jute. Only Chotanagpur

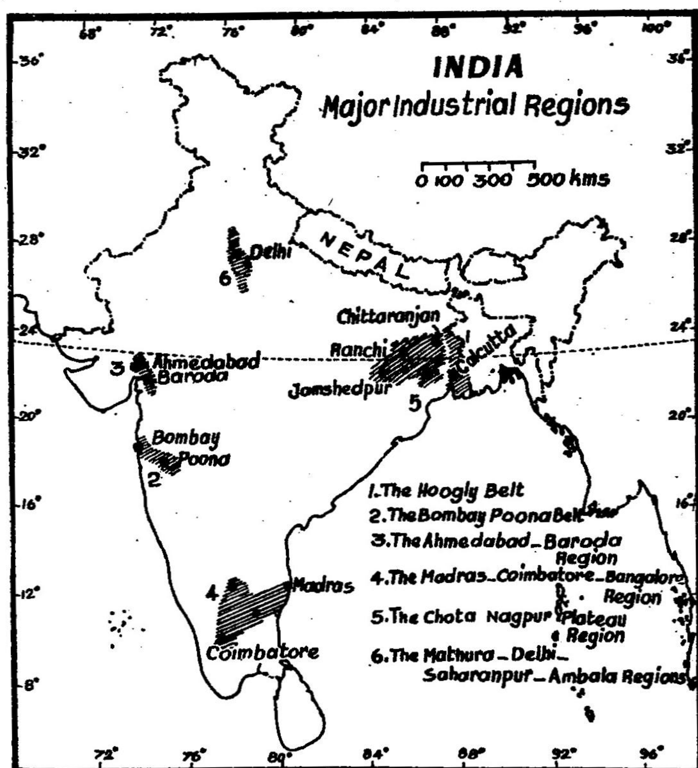


FIG. 6.6

plateau is exceptional. Here the coal and iron deposits attracted the growth of mineral based industrial concentration (Fig. 6.6).

CHAPTER VII

TRANSPORTATION

Transportation, which consists of the movement of the goods or passengers, is classified as a service among the economic activities associated with production. Transportation plays an important role in both production and distribution. Mobility of man or matter has increased as a consequence of innovations of improved means of transport systems.

Economic Significance

Transportation is an important geographic element which has a control over the location of certain economic activities such as location of Iron and Steel Industries or Cotton Textile Industries. But for the development of transportation, there would be no commercial coal mining, no surplus production of grains and other surplus production of commodities. Transportation, therefore, affects the value of goods both in demand and supply. Without this service the world's economy would remain at primitive state itself, i.e. at a subsistence level. In the present economic conditions of the world one cannot deny that no one country of the world is self-sufficient in respect of its economic development and growth, whether they are developed or developing countries.

Social Significance

The development of transportation assumes an important role in bridging the gap among the people of divergent cultural heritage. It transforms the rural country-side slowly.

The concentration of people in big metropolitan cities requires well-knitted transportation facilities to move both men and matter. Similarly the dispersal of settlements also requires a net to connect them from one end to the other end of the country. Thus, the transport plays a significant role in the social life of human society by aiding them to travel for various reasons ranging from weddings to religious or pilgrimage trips.

The transportation system can be broadly classified as:

(1) Surface transportation

(2) Water transportation

(3) Air transportation.

The surface transportation can be further sub-divided into Human porterage, Animal transportation, Road transportation, Railway transportation and pipelines. Water transportation can be classified as inland water transportation and ocean transportation.

SURFACE TRANSPORTATION

(A) Human Porterage

Initially man walked from place to place in search of his food, carrying his load on his back. In the mountainous regions, where the construction of highway or railway is not possible due to terrain conditions, the human porterage becomes essential. At present some movement of goods over land still takes place by means of human porterage. This still continues in some parts of the world. *e.g.* The areas in central Africa, parts of South East Asia and parts of China.

(B) Animal Transportation

As the civilisation started progressing man was able to domesticate the animals and since then he started using animals to move his goods from one place to another. Horse is the main draught animal in Europe. Ox was of greater importance in eastern Europe than that of the horse. In the Mediterranean region mostly the ass, which lives better than the horse on the scanty herbage is the draught animal. Mule replaces the ass and horses on the mountainous parts of the region.

In Asia and Africa some of the important animals used for transport are oxen, buffaloes, horses and camels. Camels are mainly used in the desert regions. Elephants are used in the forest regions of Burma to move the timber even today.

(C) Road Transportation

Roads and highways are the important modes of transport throughout the world. The extensibility and mobility of road transport differentiate it from other means of mechanised transportation. Road transport has assumed a special significance in a country's economic and social development since accessibility and mobility are involved in almost everything that a country wish to achieve.

Initially man walked on his feet from one place to another carrying his load on his back in search of food. As the days progressed, he domesticated animals like horses, donkey and cattle to carry him and his load. Paths, the tracks of animals were used as the roads.

The discovery of the wheel was the most important event in the history of the road transportation. Different types of coaches mounted on wheels were drawn first by men and animals and subsequently by engines. Thus, the road transport developed from one stage to another. The automobiles started replacing the bullock carts and horse driven coaches not only in urban areas but even in the country sides.

The rapid expansion of road transport has a multiplier impact on the general demand for goods and services and accelerates the growth of economic activity. Road transport has become not only the artery and vein of modern industrial development, but also the main assurance of national defence and security. This point can be further strengthened by the following:

'...Victory is the beautiful, bright coloured flower; transport is the stem without which it could never have blossomed' says Sir Winston Churchil, The River War.

During the war time, troops, armaments and other supplies have to be moved swiftly to areas of war operation and this can be achieved by the road transport development. Further, the road transport gives services more easily than the railway and the waterways because on the road no transhipment is required. The capital cost involved in the construction of road transport is

positively less than the railway transport, hence the cost of transport works out to be cheaper.

During the present century, the development of road vehicles and the rapid progress of new methods of transport have involved vast changes in the techniques of road construction especially in U.S.A. and Western Europe. Total length of the world roads is estimated at more than 20 million kilometres. The U.S.A. with about 30 per cent of world's roads has the highest kilometrage in the world. In the world during the 1972 about 271.3 million motor cars and commercial vehicles were in use, of which 214.5 million was classified as passenger cars and 57.29 million as commercial vehicles. The U.S.A. alone accounts for world's 43% of the total vehicles in use. In U.S.A. there is a car for every 2.1 persons. West Germany ranks second only to U.S.A. with 15 million cars, i.e. for every four persons there will be one car. Between 1938 and 1972, the world's total automobile vehicles were increased over 400%. For the same period U.S.A. registered an increase of 300% with regard to vehicles. The north-eastern U.S.A., the industrial and agricultural region of the country, has the densest road network. This almost coincides with the high density network of railways too.

Canada's road transport is mainly developed along the U.S. border and on the eastern coastal plain. The world's longest highway connects the Pacific coast with that of Atlantic.

In Latin American countries the development of highways is not much. Because of the physical environment, road transport has better opportunities for development than the railways and waterways. The Pan-American highway is worth mentioning here, because it ultimately extends from Alaska in North America to the tip of South America crossing each continental nation.

Until 1960, the development of highways in Argentina was not satisfactory. The government gave importance to the construction of highway since 1960. At present it has more than 18,000 kms. of all-weather roads.

Brazil has a moderate development of road transport. It has about 80,000 kms of all-weather roads. Mostly the developments

are found in the north-east and the south-east. The worth mentioning highway in Brazil is the 1,800 kms Trans-Brazilian highway which connects Balem with Brazilia and constructed through the densest jungle in the world.

In Columbia, because of harsh physical environment, not much of road transport development has taken place. The animal transport is still dominating in transporting the goods in the high mountainous parts of the country.

Europe

The north-western Europe, which is highly industrialised, urbanised and densely settled areas possess more than 75% of the continent's vehicle and well serveds network of roads. The density of roads comes down as one proceeds towards east and south.

France, with 80,00,000 kms road length, ranks first in Europe in the highway development. The Netherlands has the highest road length per 100 square km of area in the world.

In Great Britain, London is the main hub of highway development.

In Soviet Russia the road transport plays a small part in the transportation of goods, accounting for only about 1/12 of the country's total freight turn-over. The road transport is very well developed to the west of Urals. To the east of Urals Central Asia and Siberia are very poorly developed in road transport system. The climate plays a dominant role in the development of road transport system in Soviet Russia. The severe winter, the presence of permanent frost in a larger part of the northern half of the nation and the poor drainage make most Soviet roads impassable during many months of the year.

Asia

Considering the enormous size of Asia, it is very poorly developed in road transport. This is mainly because of the lofty Himalayas and other mountain ranges which obstruct the construction of highways through them. The lack of proper road network in Asia is a drawback for its economic development and growth.

The road transport development is not much in India. It has a total road length of about 1,20,00,000 kms of which only 1,00,000 kms are all-weather and motorable roads.

The development of highways in their lands helped to improve its economy. The Friendship Highways built up only a few years ago, has transformed partially used jungle lands along its hundred and sixty kilometres range into highly productive and prosperous farms and substantial amount of surplus grains is now exported to Japan.

Africa is not well developed in all-weather roads. Among the countries of Africa, South Africa is relatively well developed and has a good road system. The terrain and the deserts are the hindering feature in the development of roads in north coastal West Africa.

Australia ranks fifth largest in the world after the U.S.A., U.S.S.R., India, and Japan with 9,02,773 kms of road length. The road transport is well developed along the east and southern coastal regions of the country.

(D) Railways

Significance

Among the land transport systems the railways play a significant role in the movement of both the passenger and goods traffic. Though the railways require a large amount of capital for construction and maintenance its operational charges can be reduced by increasing the traffic carrying capacity by modernising the railways, i.e., from steam to diesel or electrical hauling and also by multiplier tracks. Railway is the best mode of land transport for far-off destinations and especially for bulker commodities, as it works out cheaper than the road transport. The development of railways plays a significant role in a country's economic development. But for the development of the railways certain parts of the world such as the Great Plains of U.S.A., Canada, interior plains of Australia, and Siberian plains of U.S.S.R. would not have been developed both economically and culturally. Further, the railways play a dominant role in a country's defence by moving troops and defence materials from one part to another at the time of emergency.

Among the physical factors both topography and climate play a prominant role in the construction of railway tracks. The construction is easier if the area is without much relief. Normally, if the gradient is too steep i.e. more than 1:100, then it is difficult for the locomotives to pull the train. In the mountainous regions, if the gradient is higher, then a special type of railway line has to be constructed. Such types of railways are known as rack railways in which the engine can use the rack or toothed rail on steep sections. Rack railway tracks are constructed in different parts of the world since 1868 when the first mountain track railway line was constructed in Mount Washington, U.S.A. Apart from the steep gradient sections the mountains have to be tunnelled for the movement of the railways. It requires not only enormous amount of money but also highly skilled technicians. Simpleton tunnel is the longest tunnel constructed in Europe during 1905-06 between Brigue (Switzerland) and Isle (Italy) for a distance of 19.7 kms. Sometimes, the rivers also pose problems for the construction of the railway lines. To cross the natural barrier, the river bridges have to be constructed. The world's highest bridge, 'Fades' is over River Seoule in France. Here, the river flows at a depth of 140 metres from the railway bridge. The world's longest railway bridge, 'Storstrom' is across the river Masned Sd in Denmark. It runs to a length of about three kilometres.

Waterways have also been crossed by tunnels where bridging is difficult, for example, Severn and Hudson. The Severn estuary is crossed at the Sheots where the river is 16 metres deep, the tunnel is over 6.5 kms. long. In Asia an under sea tunnel was constructed in 1942 between Honshu and Kyushu for the movement of the trains.

Apart from topography, the other important controlling factor of railway construction is the climate. The change in the weather conditions can affect the construction as well as operation of railways efficiently during the rainy seasons or cyclones.

In the desert areas, the shortage of water poses a big problem for the construction and operation of railways. In certan areas the fresh water has to be carried for more than hundreds of kilometres as in the case of Utah, where the Lucin-cut-off was constructed.

The humid areas, also on the other hand, give problem to the authorities as in the case of the desert regions; of course, the situation and the problems are entirely different. The moisture has a destructive effect on the wooden sleepers and other wooden works of bridges. The sudden downpour may damage the tracks by washouts. In the black cotton soil regions of the Deccan, the rain turns the soil into a glutinous mass and repairing the track is made most difficult at the time it is most needed. Snow can hinder operations in a number of ways in the temperate lands by choking the fuel (coal), by sweeping in a avalanche over the line, by obscuring the signals or by clogging the moving parts and causing them to fail to respond to the signal levers

In the tropical areas, because of the high temperature the steel rails expand and to counteract these, gaps were left between the rail lines. At present the problem has been overcome by welding the rails together for longer distances.

Among the countries of the world, the U.S.A. stands first with 360.16 thousand kilometres of railway track, followed by the U.S.S.R. (122.8 thousand kilometres), Canada (70.24 thousand kilometres) and India (58.27 thousand kilometres). The total length of railways in selected countries are shown in Table I.

TABLE I

The Length of Railways in Principal Countries

Countries		Length of Railways (in Thousands of kms.)
1. U.S.A.	...	360.16
2. U.S.S.R.	...	128.80
3. Canada	...	70.24
4. Brazil	...	38.00
5. F.R.G.	...	30.60
6. India	...	58.27
7. Japan	...	27.80
8. Australia	...	42.24
9. France	...	42.24
10. U.K.	...	36.64
11. Poland	...	23.04
12. Italy	...	23.30
13. Pakistan	...	7.20

United States of America

The U.S.A. which has about 4% of the total land surface of the earth has about 6% of the world's total population. It has the largest railway network in the world (30% of the total world railway kilometrage) because of its very high standard of living. About 40% of the inter-city freight movement was carried on by the railways. The network of railway lines are more denser in the eastern coastal region, which is a highly developed industrial belt of the country. The food items and other raw materials from the west and southern parts of U.S.A. move to the eastern industrial belt. More traffic movement takes place at the coal mines of the northern Appallachian near Pittsburg, diverging eastward to the middle Atlantic coast of New England and westward to the middle west. From the north-east U.S.A. the manufactured goods are transported to the west and south. Chicago, in this region of U.S.A. is the world's biggest railway centre, because of its location on the Lake Michigan, where virtually all lines of communications converge. It serves as a terminal point for 21 trunk lines which extend from north Canada to Mexico in the south and from Atlantic in the east to the Pacific in the west.

In the south, the railway network is not as dense as that of the north-east. To the north of Ohio and Potamac the important goods which are transported through railways are the lumber, cotton, tobacco, livestock, fruits, coal, etc. Here the railway tracks run mostly north to south in contrast to the rest of the country where the main orientation is from the west to east.

The railway network almost comes to sparse as one proceeds to western U.S.A. because of semi-arid conditions. The population concentration is also less in the area—so a little of railway traffic is generated from this area. The Rocky mountains made it difficult to construct railway lines and thus only seven railway tracks traverse the Rocky Mountains from the east to reach the Pacific coast.

The U.S.A. may be divided into three broad rail traffic zones as follows:

1. Northern, 2. Central and 3. Southern. The northern zone comprises Seattle, Portland, Minneapolis, St.Paul, Duluth,

Milwaukee and Chicago. From this zone raw silk, tea, canned fish, apples and other agricultural and mineral products of the interior move towards the east.

The central zone comprises Salt Lake City and San Francisco and Ogton. This area supplies mainly the agricultural products to the east. In the southern zone two rail roads move eastward from Los Angeles, one branch to Chicago and another to Houston. This railway transports agricultural and pastoral products and minerals.

Canada

Though Canada has a large area nearly the entire population is concentrated within 500 kms of its border with U.S.A. About 9/10th of the country comprises of Tundra, forest, water and waste lands. The net work of railway in Canada resembles that of the Western U.S.A. It is running for a great distance through sparsely populated area with little available traffic. In the Canadian Shields new lines are constructed at present, because of its rich metallic mineral resources. The country is efficiently served by two great trans-continental railways, the Canadian Pacific and the Canadian National, mostly they try to avoid duplication of service (Fig. 7.1). The country has about 68,300 kms of railway track and about 4,000 kms of double track. The government owned Canadian National railway operates more lines through sparsely settled areas having a little traffic. It connects the inner ports like Prince Rupert, Churchill, and Mansonne. In contrast with U.S.A. the Canadian National Railway lines are running from Atlantic coast to Pacific coast. The Canadian National Railway runs from Vancouver via, Edmonton to Winnipeg and thence to Montreal and to Quebec. This line crosses the Rockies, through the Yellow Head Pass. The other railway, i.e. the Canadian Pacific railway runs from Vancouver on the Pacific coast to Ottawa, Montreal and Quebec and also to Halifax. This rail line crosses the Rockies through the 'Kicking Horse Pass'. These railways serve the wheat producing areas of the prairies and the mining areas in the eastern and western parts of the country.

Latin America

Latin America, which comprises of 20 countries completely lacks an internationally connected railway system. Only four of the 20

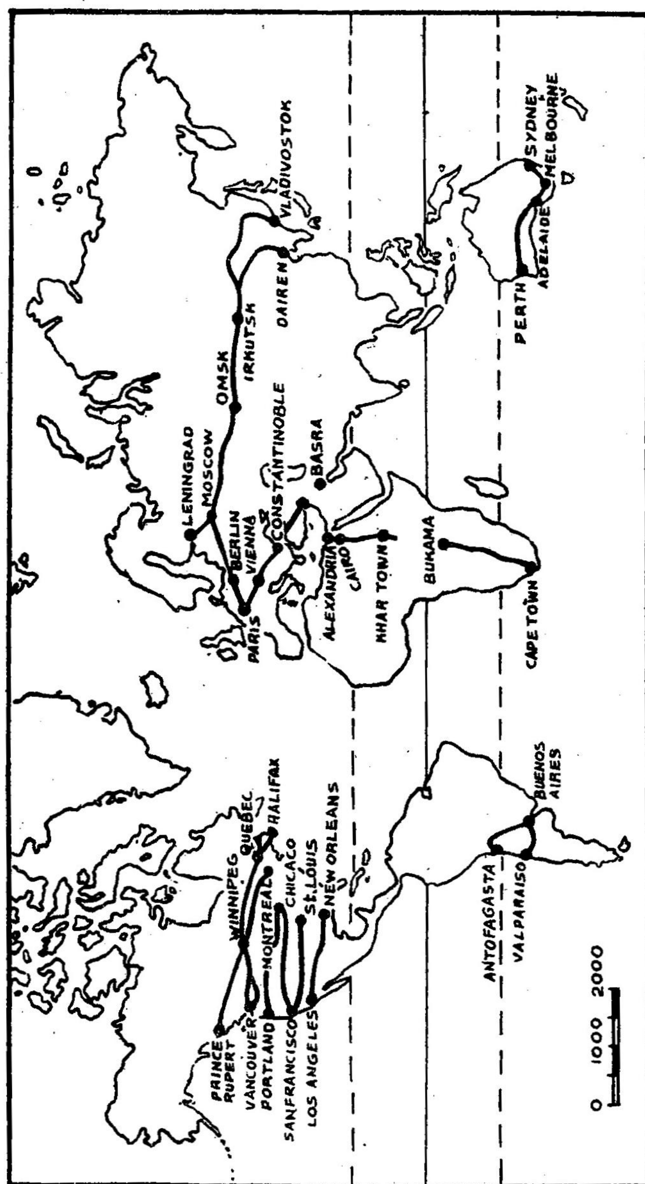


FIG. 7.1 Trans - Continental Railways

countries have some amount of railway network. In many of the countries the railway tracks are not continuous and thus they are poorly integrated with the settlement pattern as to make the movement of freights very costly. The railway lines were constructed earlier by Britishers and French, mainly to safeguard their own interest i.e. to transport the necessary required raw materials from the interior to the port of shipment. Further, the railway tracks constructed on different gauges pose a problem for transhipment of goods not only between one country to another but within the country too. The construction of railway was mostly confined to periphery, because of the volcanic ranges of Central America, the high ranges of the South American Andes, the rain forest, the flood lands and the swamps. A considerable amount of railway network is found in parts of Mexico, Argentina, Uruguay, the central plateau of eastern Brazil and middle Chile.

Peru has a total railway trackage of about 4,000 kms. Peru's most significant and famous line is the Central Railway which climbs up the valley of the Rimerc from Callao to Oroya. The railway track constructed on a standard gauge line (1.435 metres) goes to the world's highest point 4335.65 metres. It crosses through 66 tunnels and about 58 bridges. The main item of goods transported through this line is copper, lead, zinc, vanadium, and other minerals.

Among the countries of the South America, Argentina is best served by railway that too in less than a quarter of the country in the Pampas. It contains about 75% of the total population about 80% of the cultivated land, about 75% of manufacturing and 75% of the railway kilometrage. In other areas the rail density is low. In Patagonia only an occasional line reaches inland from an Atlantic port.

Brazil

The railway network is mostly concentrated from Rio de Janeiro to Santos the area away from the coast. The region comprises 11% of the country's total area with about 50% of the nation's population and industry. It is also the prime centre of coffee production.

Chile

The government owned railway runs from north to south in alignment with the country's shape. The railway here couldn't transport goods from one end to another without transhipment, because of the differences in the gauges of railway tracks.

Europe

This continent is one of the best served parts of the world by a dense railway network. It accounts for about 33% of the world's railway kilometrage. In the North Sea region the network of railway is dense because the land and water routes converge. Further the region has a high population concentration and manufacturing centres. As one proceeds towards east and south the railway track distribution comes down, as agriculture replaces the industries. The Pyrennes, the Alps, and the Carpathian mountains are traversed by a few lines. The railway in Europe has to face a stiff competition from the waterways, the cheapest mode of transport. Further, the government control on the movement of goods and passengers from one part to another i.e. between one country to another in the form of tariff rates and customs make it difficult. Except for the Leningrad-Moscow area railways were not built in eastern and south-eastern Europe until after 1856. European railway system was completely thrown out of order during the World War II.

United Kingdom

The world's first railway was constructed in Britain and the first locomotive pulled a passenger train on the Liverpool and Manchester Railway in 1825. Private enterprise was responsible for the construction of the railways in U.K. and it resulted in a haphazard growth without a proper National system. London is the main hub of the British railway system where all main lines converge.

U.S.S.R.

The railway accounts for about 60% of the freight turnover. It has a total length of 1,35,000 kms of railway lines. This is a little

more than 10% of the world's railway network. The Soviet railway accounts just a little less than 50% of the freight turnover of the world's railways. In other words the Soviet railways operate about five times as intensively and as efficiently as the railway network of the rest of the world on an average. More than 1,10,000 kms of railways are served by diesel and electric locomotives.

U.S.S.R. ranks next only to U.S.A. with regard to the railway kilometrage. The development of railway played a notable role in the economic development of the country. In the world no other country is depending so much upon railways as does the Soviet Union. Its rail traffic increased to 13 folds between 1913 and 1954. About 90% of the ton-mileage of all Soviet domestic transport is hauled by railway as the country is poorly served by coastal inland waterways.

The area of major development of the Soviet rail-net is triangular in shape. The base being represented by a track from Leningrad to Odessa on the Black sea, the tappering apex of the triangle extending eastward into Siberia. The Trans-Siberian railway which is double tracked runs from the apex of the triangle to Vladivastok on the Pacific coast. This line was constructed in 1904. It has a total length of 3,640 kms and ranks first in the world. The construction of double track was completed between 1928 and World War II. The Manchurian and Chinese railway systems are connected by this Siberian track. The Trans-Siberian line between Moscow and Omsk crosses the rich agricultural lands of East Europe and the Urals. From Omsk the track moves to Irkutsk and Lake Baikal after crossing the Ob and the Yenisie rivers. The track further runs to the Amur valley and reaches Vladivastok on the Pacific coast after crossing through Manchuria. A southern branch from Harbin of Manchuria connects Port Arthur via Mukden.

The maximum density of railway network is found on the European part of Soviet Union in Leningrad, Moscow and Ukrain industrial regions. Moscow is the centre of the Soviet railway system. The railway tracks reach the areas of rich mineral and forests of north and to their ports from the main line, e.g. to the ice-free port of Murmansk to Archangel and to the Pechora Basin.

Among the railway networks in Soviet Russia four lines are important. They are:

1. The main track which joins the industrial-centres of the European part of the country with Black sea, Baltic and White sea with coal of Donetz Basin; with the Ukrainian grains and with Urals and Siberia.

2. The Siberia and the Chkov-Tashkent main lines.

3. The Turkestan-Siberian railway lines, through which large quantities of timber and grains move from Siberia to central Asia.

4. The Caucasian railway.

Asia

Asia is the world's largest unbroken land mass, and it has the need for the development of land transport in the form of railways.

Japan, in spite of its small size and rugged topography has a fairly good railway system. Japan has a dense railway net than any other country of Asia and maximum density occurs on the small and crowded plains of eastern Honshu. The trunk lines in general follow the coasts, avoiding rugged terrain and at the same time serve the dense population of low lands. One of the modern improvements has been the under sea tunnel, opened in 1942, linking Shimonoski and Moji under the Shimonoski strait. The construction of the line reduces the journey time across the straits of Shimonoski from one hour by sea to 10 minutes.

South-east Asia

The railway lines are mostly constructed by the colonial powers to help the shipment of plantation crops. From Singapore to northern Thailand there is a metre-gauge line through Malaya.

Indonesia

Java has a route kilometrage of about 5,300 kms while its larger neighbour Sumatra has only about 2,000 kms. In Java, the rail system is well developed. No area is 30 kms away from a railway line and good express services link the important centres. In Sumatra the network is more fragmentary.

India

The railway network in India was the contribution of Britishers to India. The first railway from Bombay to Thana was opened in 1853. The original network was based on Lord Dalhousie's recommendation that Bombay, Calcutta, Madras and Lahore should be the points in the framework. The Indian Railway handles about 80% of goods traffic and 70% of the passenger traffic. India ranks fourth in the world with regard to total kilometrage. The railway network is very dense in the Gangetic Plain, the rich agricultural region of the country. The density of railway network comes down as one proceeds towards south because of the terrain conditions.

China

Most of the railway trackage exists between the Great Wall and the Yangtze-Kiang and in the north and north-east. Most of them were constructed by foreigners. Nearly half of China lacks a good railway network because of the physiography of the terrain. From the capital, Peking the railway lines are radiating to its important centres like Tienstsin, Suiyan, Nanking, Shangai, Canton, etc.

South-west Asia

The railway network is sparse in most of the South-west Asian countries. The terrain is the one of the main factors apart from the fact that the demand for railways is also less because of sparse population settled in this semi-arid region.

Africa

The continent has a very poor railway facility. The physical environment of the continent possibly more so than that of the other continents, presents the greatest number of obstacles to rail transport. The rain forest, deserts, and savannas, high central table land, the non-availability of coal and the scarcity of good water (suitable for boilers) are some of the barriers for the development of railways in the continent.

In the north, a small network of railways has been developed in Egypt, Tunisia, Algeria and Morocco (Fig. 7.2). South Africa has the maximum railway network in the whole of Africa. The important railway line in the continent is the Cape-Cairo route. It does not have continuous railway connections. A railway line

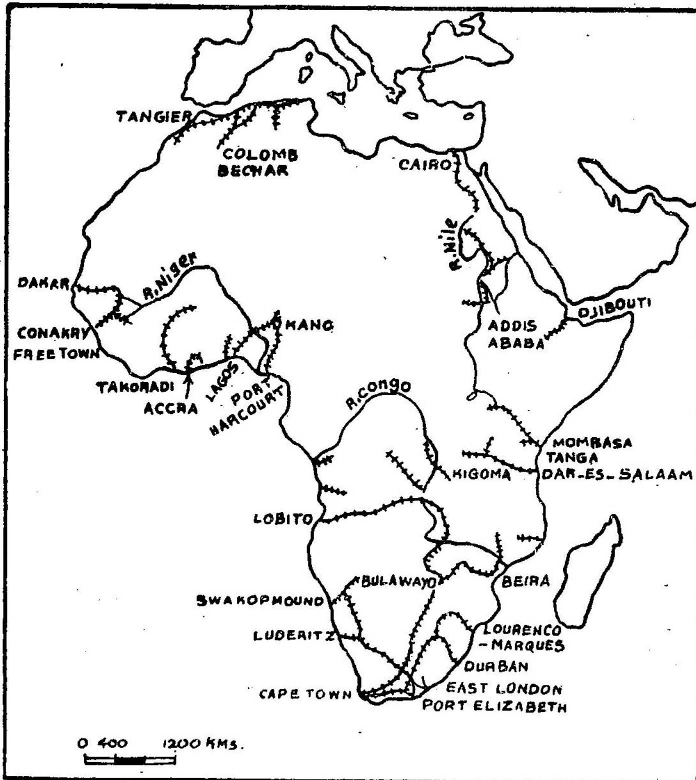


FIG. 7.2 Railways in Africa

connects Cape Town in South Africa with Bukama in Belgian Congo. Then between Belgian Congo and Victoria there is road-cum-river route. Again there is a road-cum-river route from Victoria to Khartoum. Khartoum is connected with Cairo via Aswan by a rail line. If the Cape-Cairo route is completely constructed then positively this will open a new ground for the development of Africa as a whole.

Australia

The development of railway was mainly controlled by the harsh physical environment. About 33% of the total area of the country is under desert and another 33% is too dry for any agricultural operations. Hence the population is mostly found along the coastal area especially on the east and south (Fig. 7.3). Hence, the railway network is mostly developed in these regions. There is one continental railway line, the Trans-Australian railway line. This was

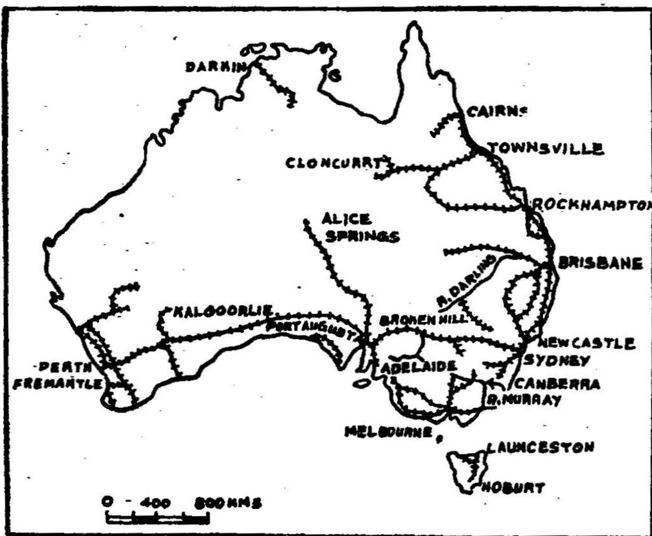


FIG. 7.3 Railways in Australia

constructed by the Commonwealth Government for a distance of about 1,680 kms from Port Augusta in South Australia to Kalgoorlie, a gold mining area in West Australia. There is no such line extending from north to south. Railway connections are also found between Port Augusta and Sydney on the Eastern coast. Kalgoorlie is connected with Perth on the western coast by a narrow gauge line.

(E) Pipelines

The pipelines are used as a mode of transport system to move the oil and natural gas to refineries or to markets. This mode of

transportation is the cheapest means of hauling petroleum over land. In 1865, first pipeline was constructed in Pensylvania, U.S.A. to transport oil. But pipelines did not really come to their own until 1931, when the first long distance line (1,600 kms) was built from Texas to Illinois. At present U.S.A. which has about 3,20,000 kms of oil pipelines, leads the entire world. About 60% of the total country's crude oil pipeline lengths are found in the areas of Kansas, Oklahoma and Texas.

Canada

Canada's oil fields are separated from the cities and market by thousands of kilometres of wilderness. This has made essential the construction of long distance pipelines to refining centres in Ontario and British Colombia. The world's longest inter-provincial line carries crude oil from Edmonton, Alberta to Sardina, Ontario and to Port Credit on the outskirts of Toronto. It runs for a distance of about 3,100 kms. Another important pipeline is the Trans-mountain constructed from Edmonton to Vancouver.

Venezuela is one of the best served South American countries in respect of pipelines. In Europe the development of pipelines is not much as it is poor in crude oil reserves.

In Soviet Union, the pipeline plays a major role in the development of oil industry. A major flowline was across the Caspian, up the Volga, and across the Black Sea to Ukrain.

The world's richest oil region, the Middle East makes the full use of pipelines. Iran has an impressive pipeline network among the countries in the region. Many large diameter pipelines, the longest being 1,708.8 kms in length, has been opened from the fields flanking the Persian Gulf to Points on the eastern Coasts of Mediterranean sea in order to circumvent the trip around the Arabian Peninsula and back, 96,000 kms in length and to avoid the Suez canal tolls.

Natural gas pipelines are mostly found in U.S.A. Apart from U.S.A. it is almost confined only to Argentina, Europe and Soviet Union.

WATER TRANSPORTATION

Inland Waterways

Navigable rivers, lakes and canals come under the category of inland waterways. Rivers and canals restrict the transport by their width, depth and gradient. Perennial rivers without much swift currents and falls make a river fit for navigation. It promotes the internal trade by transporting the goods at a much cheaper rate than any other mode of transport.

Rivers

U.S.A.: At present there are about 30,000 kms of navigable water-ways in the U.S.A. The two important rivers are Mississippi and Missouri. The Mississippi river system provides about 8,000 kms of waterway for navigation. The Great Lakes and the Mississippi river is linked together by Illinois River. Pittsburgh, the source region of Ohio river, is connected with Mississippi by the Ohio after running for a distance of about 1,568 kms. The Missouri river is navigable for about 1,200 kms.

The four significant river systems, the Magdalena, the Orinoco, the Amazon and the Paraguay-Parana-La Plata are found in South America especially in Columbia, Venezuela, Brazil, Peru, Argentina and Paraguay.

Europe is endeavoured with a good number of navigable rivers, among which the Rhine is important. It serves the needs of the rich coal region and the highly industrialised Ruhr. Apart from Germany, the Rhine also serves France, the Netherlands and Switzerland. It runs for a distance of about 820 kms. Next to Rhine the important navigable rivers are Elbe in North-west Europe and Danube in the South central Europe.

Rivers are much used for the movement of goods in the Soviet Union. The rivers are used only for eight months in a year for transport purposes because of cold winters, which restrict the movement for the rest of the period. Volga is the important Soviet river and it carries 50% of the total tonnage transported over all the inland water ways. Some other important navigable rivers of Soviet are Dnieper, Don, etc.

Yangtze-kiang is the Asia's largest inland waterway. It runs for a length of 4,960 kms. The Yangtze-kiang serves roughtly 50% of China. The other important navigable river, Si-kiang is in south China. The river Irrawady serves Burma as an important inland waterway. River Ganga serves the needs of the Indian plain in the movement of goods.

In Africa Nile is navigable for about 1,440 kms. But not much goods move through it, as it didn't have a rich hinterland. The Zambezi, Limpopo and Congo are the other important navigable rivers of Africa.

In Australia the Murray and Darling are the two most important rivers which are navigable.

Canals

The canals are man-made waterways. Often they connect areas of mutual trade or shorten the distance between two places.

U.S.A.: In 1855 'Soo' (Sault-Sainte-Marine) canal was constructed to connect Lake Superior and Huran. Even though both the lakes have a natural link it is not useful for navigation because of the world famous Niagara Falls enroute. Hence, this canal was built. It has been mainly constructed to avoid the waterfall of St. Mary river. It has four locks to control the level of the water flow in the canal. But for this canal the bulk cargoes of iron ore, coal, limestone, cement, and wheat could not move in such a heavy quantity and at such a low cost till today. Erie canal is another important canal of the country. The old Erie canal now New York State Barge canal is important and it connects Lake Erie with Atlantic ocean through Lake Onida, river Mohawk and river Hudson.

In Canada the important canal constructed in 1829 is Welland canal. It linked Lake Erie with Lake Ontario over a distance of 34 kms. At present the canal is a segment of the New St. Lawrence seaway accommodating ocean vessels.

Europe: The Dortmund-Ems canal provides the country with an all-German waterway from the Ruhr to the North sea. Nether-

lands owes much of its economic development to the canals which traverse the entire nation.

In Soviet Union Volga-Don canal is the important one—Because of this canal land bound Moscow is connected with five seas—the White, Baltic, Black, Azov and Caspian.

The Grand Canal (1,700 metres) is vital to Chinese economic development as it flows in a north-south direction while most Chinese rivers flow from west to east.

Lakes

The Great Lakes between U.S.A. and Canada together with the St. Lawrence is the greatest of all the world's inland waterways in volume of freight handled. Through the Great Lakes bulk commodites like coal, iron ore, limestone, oil, etc. move at a cheaper cost. Some of the important ports on the Great Lakes are Duluth, Buffalo, Chicago and Fort William.

OCEAN SHIPPING

Phonecians were the first commercial mariners of the world. The Greeks and Romans were the first to reign over the sea. The development of ocean shipping transportation on modern lines emerged only after the invention of the Mariners Compass. This made possible for circumnavigation of the world since fifteenth century by the Portuguese, Spanish, English and Dutch. Robert Fulton who invented the steamship, revolutionised maritime commerce.

First steam boat was built in 1901 by Symington. Atlantic ocean was first crossed by a steamship in 1919 and in 1838 two ships sailing almost the same time from Cork and Bristol respectively, made the first commercially successful steam voyages across the Atlantic. The first iron vessel made a trip from London to Paris during 1820. In 1881, the invention of steel made it possible to replace iron. During 1911, diesel oil engine was first used instead of steam engine and this made a breakthrough in the shipping transportation. At present the ships sail with nuclear power as its energy.

Advantages

Water transport is chaper than land transport systems because this provides tailor-made highways. No huge capital is required either for the construction of the ocean routes nor to maintain them as in the case of land transport. The ocean water can be used by all the countries of the world to run their liners from one part of the globe to another without paying any tax. Further, the cost per ton and at comparatively low speeds friction is less than the land. Thus expenditure for power is lower per ton of goods when they are shipped.

The Routes

Most of the shipping routes either originate or terminate at two important highly industrialised regions of the world, viz., the eastern coast of U.S.A. and the western coast of Europe (Fig. 7.4). Thus of all the oceans and seas the Atlantic ocean assumes a significant importance in the world shipping transportation.

1. The North Atlantic Route

The North Atlantic route, which links the ports of West European countries with the ports of the North America, is the busiest route in the world. It links the world's best two major industrialised and manufacturing regions of highest standard of living. About a third of the world's market vessels cross this route.

In earlier days this route served the European emigrants to America and to transport raw materials from America to Europe. In recent times the trend is completely changed, i.e. the manufactured goods started moving towards Europe and with more of American tourists to the continent. At present, about 50% of world's freight is taken by most of the world's ocean passengers and more mail transit is made on this route than the other ocean routes of the world. The east bound goods include foodstuffs, raw cotton, lumber, petroleum and manufactured goods. The west bound goods include French wines, and Mediterranean olives. Some of the important ports on the American east coast are Quebec, Montreal, St. John, Boston, New York, Philadelphia, Baltimore, Charleston and New Orleans, on the west coast of Europe are Glasgow, Liverpool, Manchester, Southampton, Bristol, London, Rottordam, Lisbon, etc.

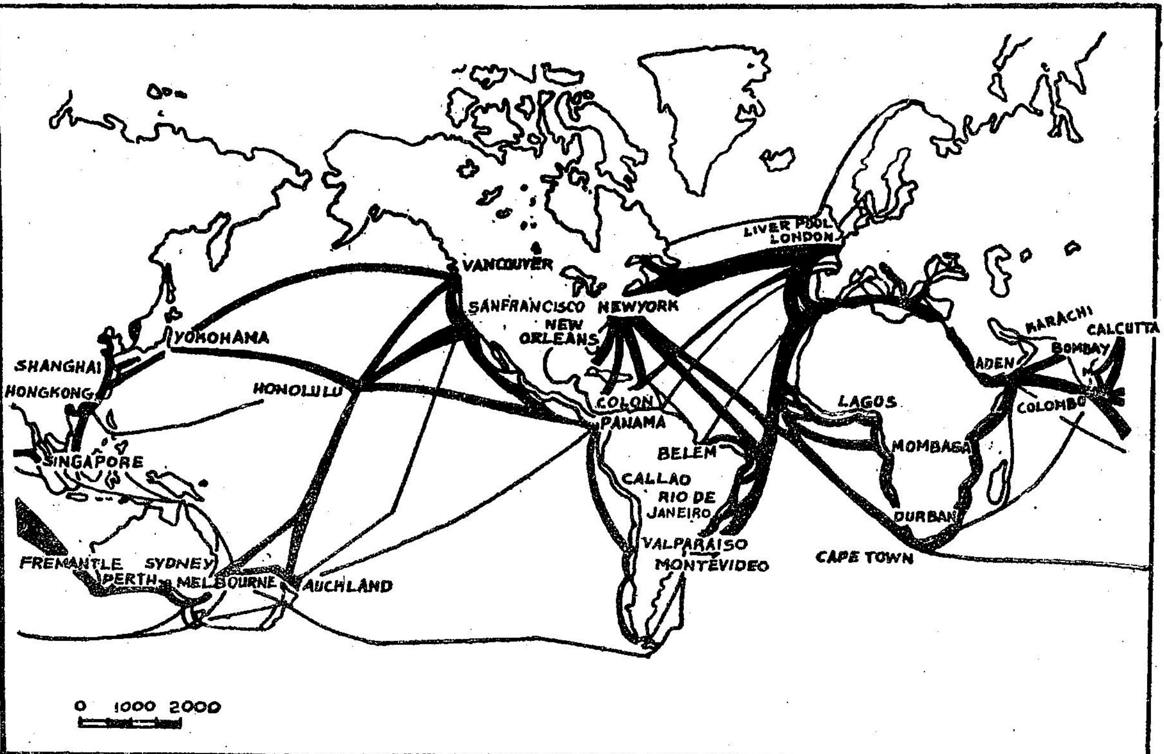


FIG. 7.4 Main Ocean Routes of the World

2. The Mediterranean-Red Sea (Asiatic) Route

This route is the single largest trade route in the world. It is the second most important route next only to the North Atlantic route. This route links European countries with India, Sri Lanka, Far East, Japan, Australia and eastern African coast. Thus it serves more than 50% of the world's land area and the majority of its population. The important link between Atlantic through Mediterranean and India through the Red Sea is the Suez canal. But for the canal this route could not have come into existence.

The Mediterranean-Red Sea route has a good number of branch lines. From the European coast the main trunk route runs through the Strait of Gibralter, the Mediterranean sea, the Suez canal, and the Red sea into the Indian ocean (Table II). The Asian trunk route branches off towards the ports of the Persian Gulf and another

TABLE II

Relative Advantage of the Suez Canal over Cape Route

(in kms)

	Via Suez	Via Cape	Savings in Distance	Savings in Time (days)
London to Bombay ...	10016	17152	7136	23
London to Calcutta ...	12693	13320	5627	17
London to Singapore ...	13184	13520	5336	17
London to Hong Kong ...	15488	20824	5336	17
London to Persian Gulf ...	10240	18080	7840	28
New York to Bombay ...	12963	13417	5454	16
New York to Hong Kong ...	13682	22346	3664	12

to the east coast of Africa. The trunk route leads to India and Sri Lanka. From the Colombo port, Sri Lanka, the trunk route bifurcates into three branch routes and runs towards eastern coast of India, north-eastward into Bay of Bengal, another to Australia, in the south-east direction, and third towards Far East and Japan.

To the European ports mostly the raw meterials from South and South-East Asia and East African coast move through this route. Plantation crops from Far East, agricultural and pastoral products from Australia and oil from S.W. Asia are exported. In return European ports mostly despatch manufactured goods to Asian countries. Some of the traffic from West Europe is mainly Mediterranean in destination and does not enter the Asiatic region through the Suez canal.

From Mediterranean iron ore and other matallic minerals, fruits and raw cotton, etc., move towards West European ports and sometimes to American coast. In return it gets requirements like timber, coal and manufactured goods.

Some of the important ports enroute are London, Rottordam, Liverpool, Lisbon, Naples, Aden, Bombay, Colombo, Calcutta, Rangoon, Singapore, Manila, Hong Kong, etc.

Suez Canal

The Suez canal plays a notable role in linking Indian ocean with Atlantic and this brings the European ports closer to South and South-East Asian countries and Australia.

French people, as early as 1846 thought of cutting a canal across West Asia to link Mediterranean Sea with that of Red Sea. The Suez canal was opened in 1870 after ten years time of construction. It has a length of 168 kms with a maximum width of 65 metres and a depth of 13 metres. There is no lock gate system in the canal as it runs at the same level throughout. The canal runs from its North Port Said in the Mediterranean sea and to the South Port Suez in the Red Sea. The canal was nationalised by Nasser of Egypt in 1956. The construction of the Suez shortened the distance between the two continents of Asia and Europe and thus more volume of trade started flowing between them at a lesser cost than earlier. The distance between London and Bombay comes down by about 7100 kms. i.e. about 40% less than what it will be in the previous Cape of Good Hope route. This strategic canal was closed for traffic for sometime due to war in the West Asia. At present the canal is again thrown open for traffic.

The main drawback, if at all, is the tax collected by Egypt at the time of crossing the canal. The steady increase of toll charges made some ocean liners to switch on this route to the Cape of Good

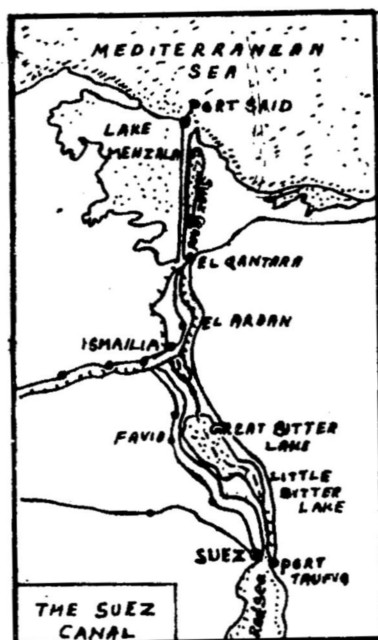


FIG. 7.5

Hope, as the difference in the operational charges comes to the same after paying the toll. So if in future the rates are going to be increased then naturally canal may lose its importance in the world ocean transportation system.

3. African-Indian Ocean Route (The Cape of Good Hope Route)

The western European ports are connected with western and southern ports of Africa, Australia and New Zealand by this route. After crossing the Cape Town the main route branches off to north towards ports on the southern part of the African East Coast. Another branch moves east towards Australia and New Zealand across the Indian Ocean which merges with Sri Lanka-Australian line of Mediterranean-Red Sea Route.

Strong Westerly winds—The Roaring Forties—are boon to east bound ships between South Africa and Australia but west bound ships follow a northerly route to evade the winds full impact and save fuel. Very big cargo vessels and refrigerator ships and big super oil tankers prefer the Cape of Good Hope Route to the Suez because of their size.

The local liners which move from Europe to Western African coast often carry cocoa, and copper from African ports to Europe. From Australia the agricultural surplus moves towards the west. The important items among the agricultural products are grains, meat, wood and dairy products. South Africa exports of more gold in value. East Africa along with South Africa supply the ferro-alloys and non-ferrous metals, sugar, hides and skins, coffee and fruits primarily to Europe and American coast.

The Eastern Coast of North America

The north-south route which originates from the New York port of U.S.A. branches off as it comes down south, one toward Brazil, where it links with the route from Europe to the east coast of south America. The second line goes to Venezuela, the rich oil country. The third route goes to western coast of North America via Panama canal and the last one around Florida to Gulf ports. Through these routes the American countries are well knitted with U.S.A., Canada and Europe.

Among the four branch routes the Panama route is very important. But for the construction of the Panama canal across Central America the movement of goods from the eastern coast of U.S.A. to the western coast or vice versa would not have increased manifold.

Panama canal was thrown open in 1914. It links Pacific with Atlantic (Fig 7.6). The total length of the Panama canal is 30 kms and has a depth of 23 metres. The width of the canal ranges between 100 metres and 330 metres. Unlike the Suez the water level in this canal is higher than the sea level. So six lock gates have been constructed for maintaining the proper level of water. The maximum depth in this canal is 12.19 m., although, in the dry seasons between January and April the water level goes down to

reduce the permissible depth to 10.67 m. or less. The main flows of shipping through the canal have been between the highly industrialised east and comparatively less developed west coasts of the U.S.A. and between the Far East and American eastern coast. The construction of the canal reduces the distance of the Pacific coast of South America and the Atlantic coast of North America by about 5,600 kms. Australia and New Zealand are nearer to the U.S.A. eastern coast through this canal. The distance between New York port to Wellington through Cape Horn route accounts



FIG. 7.6

for about 18,080 kms while through Panama canal it is only 13,600 kms (Table III). About 3/5th of the total goods shipped from

TABLE III

Distance Saved Because of Panama Canal

(In kms)

From		To	
	Liverpool	Hamburg	New Yrok
San Francisco ...	10538.76	10282.08	14643.78
Valpariso (Chile) ...	2864.40	2607.72	6969.42
Wellington ...	2909.04	2615.16	4636.98

the Atlantic to the Pacific and of this one-third originate in U.S. ports. The lumber from the softwood forests of the North-western U.S.A. started moving towards eastern U.S.A. through this canal instead of railroads, which was the main mode of transportation prior to the opening of the canal. The western grain loads of the Canadian Prairie region turned and began to exporting wheat through Vancouver, thus eliminating the land over land and Great lakes haul to Atlantic ports.

The main drawbacks of the Panama canal are that the differences in water level make it difficult for ships to sail through. Big tankers could not pass through because of their size.

The Pacific Route

The Pacific route is not well developed for certain reasons. The occean covers vast area roughly about one-third of the surface of the earth and has no large islands where sizeable shipment can originate or terminate. Further on either side of the Pacific coast because of the physiographic environment a little development has taken place either in agriculture or in industry. Thus not much surplus is generated from these areas to have a good trade system.

The ports of Japan are well connected with the ports of North and South America by this route. A branch from the main route goes to Australia and New Zealand, Hawaiian islands, the cross roads of the pacific route worth mentioning. The important goods moving through this route from west to east coast of Pacific are canned fish from Japan, sugar from Philippines, Manila hemp, copra and tropical woods. From the eastern ports of Pacific cereals, lumber, wood pulp, raw cotton, steel scraps, minerals etc., move towards west port of Pacific.

The important ports are Yokahama, Kobe, Osaka, Wellington, Honolulu, San Francisco, Los Angeles, etc.

International Waterways

Apart from Suez and Panama, the other significant international waterway is Kiel canal. This is between Baltic and the North sea. The canal was constructed in 1893, to reduce the journey around

the 400 kms long Jutland Peninsula. This was built by Germany for strategic reasons. It assumes a significant commercial importance for the trade between Hamburg, Bremen and the Baltic ports. West Germany accounts for 27% of the total ship tonnage through the canal followed by Poland (12%), Finland (9%), U.S.S.R. (6%), Holland (5%), and rest by others. The Kiel canal must continue to be important for the trade of North West Europe as it links the North sea and the Baltic, where the small ship or barge traffic is active, and lying in proximity to European Economic Community (EEC), and European Free Trade Association (E.F.T.A.).

AIR TRANSPORTATION

The use of aeroplanes and the development of air transportation is a twentieth century phenomenon. From earliest times man has dreamed of and speculated on the possibility of flight. Since the introduction of air transportation, time and space have shrunk fantastically. At present no two places on the globe are more than twenty-four hours apart by jet flights. Even this figure shrinks constantly. Now distance is measured as often in time as in miles. Except air plane no mode of human travel has contracted our world. Even though the air-transport is free from the nature of the terrain it is not fully free from the clutches of climate. To certain extent the weather in a particular area still controls the movement of air traffic. Mostly passengers and mails are transported by air transport. After the Second World War the international air transportation developed on a larger scale. The speed of air transportation has opened new markets for highly perishable commodities such as certain food stuffs, drugs and flowers.

Although total air passenger, air freight and air mails are highest in the U.S.A. and Europe, the importance of air transport is often greater in areas presently being developed.

The world's network of air route is steadily increasing in density. The U.S.A. accounts for nearly 50% of the total world kilometrage and ranks first (Table IV). The eastern and western coasts of the U.S.A. are among the most developed parts of the country.

TABLE IV

Aviation (1974)

Countries		Distance Flown (in kms)	Passengers Carried	Passenger (in km million)	Freight ton—km (in million)	Mail ton—km (in million)	Total ton—km (in million)
World	...	7370	423000	540000	17030	2450	68310
U.S.A.	...	3634	208155	262185	7257	1697.4	32741
India	...	57.6	2914	4926	163.5	18.5	615
Japan	...	263.2	27486	27797	739.4	59.6	3007
France	...	239.6	12159	21745	871.3	75.8	2888
West Germany	...	170.4	8887	12473	941.0	50.4	2139
U.K.	...	340.0	19010	27775	860.0	117.3	3560
Australia	...	207.3	10665	17123	315.3	34.4	1909
U.S.S.R.	...	N.A.	90477	108577	2046.4	428.9	12247

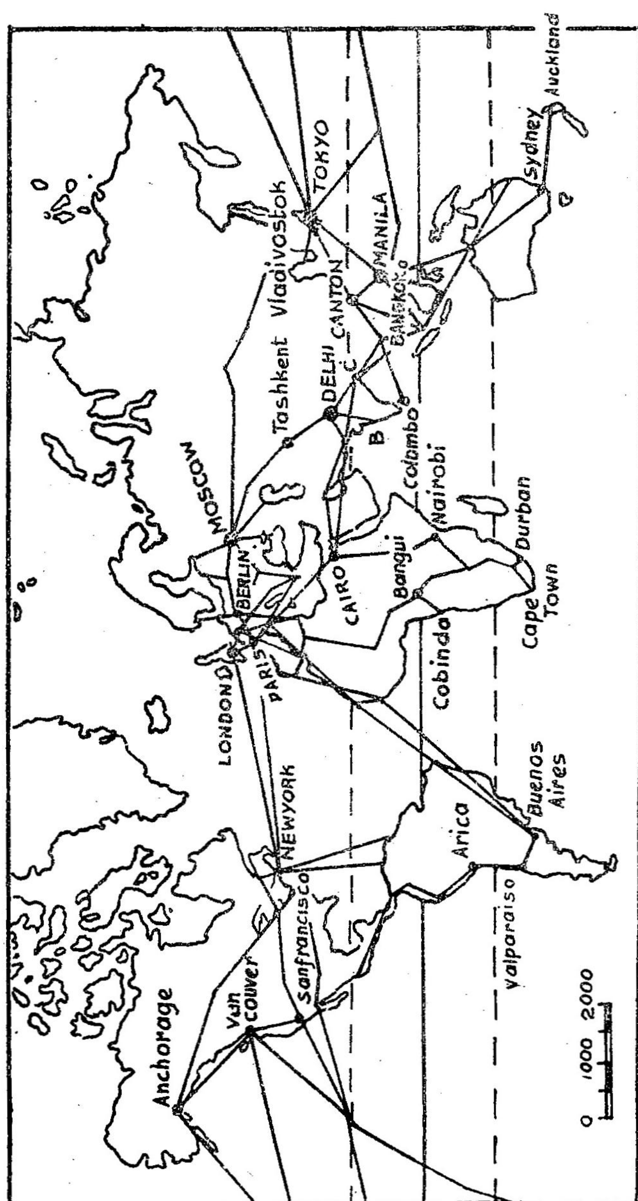


FIG. 7.7 Main Air Routes of the World

Next only to U.S.A., U.K., Japan and France rank in order according to total kilometrage flown in their countries respectively.

In U.S.A. there are about 7,000 air ports of which 50% are privately owned and 33% are owned by local municipalities. It has a fleet of about 60,000 civil aircraft. Some of the important airports are New York, Chicago, Los Angeles, Boston, Washington, etc.

The leading International air companies of the U.S.A. are Trans World Airlines (TWA) and Pan American Airways (Panam).

West Europe: All the capital cities of West European countries are important air terminals. The air services are very well organised both within the country and in between countries. The U.K. has three major airlines of which British Overseas Airways Corporation (BOAC) is important and is owned by the government. The British Commonwealth Airlines (BCA) is owned by U.K., Australia and New Zealand.

Norway, Sweden and Denmark jointly run the Scandinavian Airlines. The other important airlines of Europe are Air France of France, KLM of Netherlands and Swiss Air of Switzerland. Concord Jetliner, the product of British and French colloboration is the world's fastest aircraft at present.

In U.S.S.R. the first airline was operated in 1923. Since then air routes have exceeded thousands of kilometres, 220,000 kms being the internationl. U.S.S.R. is connected with sixty-three countries of the world by airlines. Aeroplan one of the world's major air service companies carried 71.4 million people in 1970. Soviet aviation was the first in the world to put a passenger jetplane, the TU 104 in operation. Air travel is common among Soviet people. Helicopters are widely used in the less developed regions of the north and in mountainous areas.

India: Civil aviation in India has made a rapid progress since independence. Indian aircraft flew about 630 million kms as against 21.6 million kms in 1947. They carried about 26.2 lakh passengers and 52 million kgs of cargo and mail in 1971. Air services are run by two government corporations viz. Indian Airlines

and Air India. The Indian Airlines provides air services within the country linking up most of the important centres and also to neighbouring countries such as Burma, Sri Lanka and Nepal. Air India provides an all jet service reaching out to 24 countries.

International Air routes

The air route which connects London in U.K. with Sydney in Australia passes through Marseilles, Athens, Alexandria, Cairo, Bagdad, Bahrin, Karachi, Delhi, Calcutta, Rangoon, Bangkok, Penang, Singapore, Darwin and Brisbane.

This flight throughout its route flies over either thick forest cover or over desert regions and avoiding the crossing of the sea as far as possible. Some other important trans-oceanic routes across the Atlantic are:

1. London to New York via Newfoundland.
2. London to New York via Lisbon.
3. London to Rio de Janeiro via Lisbon.

Across the Pacific are:

1. San Franscisco to Manila via Tokyo.
2. Los Angeles to Manila and Tokyo via Hawaii.

Across the Indian ocean:

1. London to Sydney via Delhi.

CHAPTER VIII

TRADE

Trade is an exchange of goods and services. It develops on surplus and shortage of goods, as the surplus and shortage stimulate selling and buying. It is inevitable as man needs a great range of things which he himself cannot produce and instead, he has to depend on trade to get the goods needed. Also, it enlarges the variety of the goods available to the people in any area, makes available anything at any season and at any area, and helps any section less dependent on its own resources.

Sometimes, trade means a local and direct exchange of goods or services, and commerce, an exchange of goods or services on a large scale or between distant trade partners. However, these two terms are nowadays being used interchangeably. Trade, today for convenience, is expressed in money value.

The development of trade has got a long history. The early trade was a simple and direct one, done on barter system and also on a local scale to a greater extent. Then came the age of discovery of new sea-routes and new lands that widened the horizon of trade. Later, the industrial development in the Western Europe necessitated the import of raw materials and food grains from the less-developed countries, thereby further intensifying the trade. The improvement in the methods of transport and communication that has been picked up since the Industrial Revolution in the west, further increased the trade transactions. The present day trade in contrast to the early one, is a complicated one and today goods pass through so many hands before they reach the ultimate consumers.

Trade Types

Trade may take place locally or between two areas in a country or between two nations, and on this count, trade may be classified into local, national and international trade. The transfer of goods between two fellow villagers or between two nearby villages is a

local trade. The trade taking place in the periodic markets of our country side is a typical example for local trade. National trade that is referred by many other terms like internal trade, home trade and domestic trade, is the one taking place between two regions of a country. That is to say, it involves an exchange of goods and services within the geographical limits of a nation. It is maintained on a single currency. It is quite natural for trade to develop on a national scale in a country as large and populous as ours, not only because of well-developed network of transport routes but also because of the fact that the country is so diversified in its physical and economic development. The trade by which Tamilnadu gets gingelly from Orissa or grams from Punjab and U.P., for example, is of a national order. The volume of local and national trade may be enormous. But it is impossible to estimate the total volume or value of this trade, for much of the trade is direct between producer and consumer or takes place through so many agencies and so, no statistics of such trade are available. The trade across the political limits of the nation is the international trade, again referred by different terms like foreign trade, external trade or world trade. It is only a modern form of barter, the accounts of which are in terms of money. It involves more than one currency and thus the world trade becomes a complicated one.

Trade, whether it is local, internal or external, develops either to supplement the home supply or to get the goods that cannot be produced by region. The trade that supplements the home produced supply is **supplementary** trade and the one that supplies the goods that are not produced is **complementary** trade. The former one results in an increased supply of goods in the buying region or country and the latter one, in an increased variety of goods. Supplementary trade is largely between the regions of similar climate and vegetation and the complementary one between dissimilar regions. So it is used to observe that supplementary trade takes place across the meridians and that the complementary trade across the parallels.

The foreign trade is regulated through the terms of trade that refer a ratio at which the goods a country imports are exchanged for those of the exports. Terms of trade indicate the mutual agreement between two trading partners to control and regulate the

production, price, flow and the like. Based on the agreement, trade may be classified into bilateral and multilateral. On a bilateral trade, country *A* buys from country *B* to the value that country *B* buys from country *A*. Thus the trade is said to be bilateral when the total imports and exports of the two countries are balanced. Multilateral trade results when a country trades with many countries and allows her currency to be freely convertible to a number of other currencies. In this system, trade between two countries does not necessarily balance and the surplus earned with a country may be used to offset the deficiencies incurred in the other countries.

Factors Promoting Trade

Trade develops between two areas or two nations on account of various reasons. The important cause for trade is the surplus and shortage of some commodities among the areas or nations involved. Both the surplus and shortage create a desire or demand to trade. For instance, India has surplus of iron ore deposits and so exports to Japan which requires iron to meet the heavy demand of her manufacturing industries. On the other hand, India, for instance, imports fertilizer from Japan to meet the demand of her green-revolution belts. The surplus and shortage may occur in any commodity. They differ from country to country, both in type and volume and this difference is caused by differences in physical environment, resource availability and plants and animals. The trade raised on differences in natural resources may show a greater degree of permanence.

A difference in the stage of industrial development is also equally an important factor in promoting trade. Generally the trade between developed and developing countries has resulted from the differences in the level of industrial development between them. The developing countries export raw materials and import manufactured goods. This type of trade was widely prevalent in those days of colonial rule and now it has been declining, as most of the colonies have got freed. Thus the trade based on the differences in the stage of industrial development may not be a permanent one in contrast to the trade based on differences in natural resources.

The distance and the development of transport have also a bearing on trade. The relatively-narrow North Atlantic trade

route is more busy than the wide Pacific. Another incidence that may denote the influence of distance on trade is that the construction of Suez canal increased the trade between East and West, as it shortened the distance; previous to this canal construction, the vessels were to reach India and Far East by sailing around the African continent. It is quiet natural that transport development leads to an increase in the trade traffic, as it facilitates the goods to be moved easily, quickly and even cheaply.

The trade policies of sovereign government too influence trade. When a government takes progressive legislative measures, streamlines the system of tariff or custom duties rationally and helps trade organisations to be more active and effective trade certainly tends to grow.

War is another factor affecting the trade. It changes the pattern of trade or even stops the trade, not only during the period of war but also for long time thereafter.

Trade may increase or decrease with reference to religion, race, national character, customs and the like. Muslim and Jewish countries do not entertain the trade in pork products because of the restrictions of their religions. The national character and social customs may help in developing certain specific skills among certain sections of people and based on these skills, a country may specialise in certain products. When these products become popular, they fetch a demand from many other countries, thereby resulting in trade. The trade on French perfumes, British tweeds, Indian brasswork, Italian statuary and the like is of this type. Of course, the volume of this type of trade is very small and also this type may not show a permanent character, as the other countries, in due course of time, may develop the skills to produce the same products.

Advertising is another factor, which is more relevant in these days, affecting the trade. Heavy advertisement of a product in the various channels of advertisement certainly allures the customers and results in trade.

Trade Centres

Trade transactions thus developed are concentrated in certain locations like port cities that are largely doing foreign trade, or at

nodal points of lines of communications. The growth of trade centres depends on the size, and variety and volume of resources of the hinterland, and the factors that determine the actual site of the trading centre. The resources of hinterland depend on climate, soil, presence of minerals and other geographical factors that create large demand and supplies. The actual site of trade centre is determined by the presence of suitable building sites, the presence of sufficient drinking water and the convergence of routes of communication.

World Trade Flow

International Trade includes all types of commodities, manufactures and machineries, foods and crude materials. Manufactures and machinery are the leading shipments from the United States. West Germany and United Kingdom are the leading importers for many developing countries. Canada, Belgium, Austria, France, Switzerland, Norway and Netherlands export large quantities of manufactures but not machineries. Countries that export food are more numerous than those exporting the manufactures. Crude materials like jute, cotton, petroleum, rubber, tin and bauxite are exported largely from the developing countries.

There is a tremendous and consistant growth in the international trade. The volume of trade has increased in 1975 by three times the level of 1960. The exports and imports of the developed countries followed the same trend. But, the exports and imports of the developing countries have increased in 1975 by little over two times the level of 1960. The developed countries shared 66 per cent of world export and the developing countries 24 per cent that is about one third of the exports of developed countries in 1975. In 1975, the developed countries shared 66 per cent of world import. They export more of chemicals, machineries, other manufactured goods and food materials and the developing countries more of fuel, raw materials and food materials. The imports of the developed countries include raw materials, fuel, manufactured goods and food materials, and of the developing countries, chemicals, machineries and other manufactured goods. Other details may be seen in the Table I. Among the developed countries, Canada, United States and Japan take major share of foreign trade, more than one fourth.

TABLE I

Share of World Trade by Developed and Developing Countries

Regions	Year	Per cent World Trade	Food %	Raw Materials %	Fuel %	Chemicals %	Machineries %	Other Manufactured Goods %
Exports								
1. Developed Countries	1970	71.8	58.8	58.9	26.3	88.7	87.6	78.4
	1975	66.2	63.6	59.0	17.4	87.3	87.1	79.1
2. Developing Countries	1970	17.6	31.9	30.5	63.4	4.3	1.6	11.9
	1975	24.1	28.3	29.3	73.9	5.4	2.8	11.8
Imports								
1. Developed Countries	1970	70.7	71.9	77.3	75.4	65.8	66.3	73.4
	1975	66.0	65.0	73.8	76.2	62.4	57.8	67.6
2. Developing Countries	1970	18.4	17.8	11.5	16.3	23.7	21.7	16.8
	1975	22.9	22.6	14.2	17.3	26.9	28.8	20.8

India's Foreign Trade

India's foreign trade is very small and its share in the total world trade is less than one per cent. India exports less than 4 per cent of its gross national products. India's foreign trade has undergone many changes since independence. India has now trade links with a large number of countries and the number of items in the export list runs to about 3000 now, against a mere 50 in 1947.

The total volume of India's International Trade during 1975-76 is in the order of Rs. 10,000 crores as compared to Rs. 1,250 crores in 1950-51. India's exports touched an all time high of Rs. 49,800 million in 1976-77 and an export target for 1977-78 was fixed for Rs. 57,500 million. India exports a large variety of goods. The major commodities of export are sugar, engineering goods, jute manufactures, tea, cotton manufactures, iron ore, leather, handicrafts, iron and steel, fish, cashew kernels, tobacco, oilcakes, coffee, chemical and allied products, spices, mineral fuels and related material and coir. These commodities account for about 75% of total value of exports in 1975-76. During the post-independence period, the export of iron-ore, engineering goods, sugar, handicrafts and chemicals have increased considerably. The exports of traditional items like jute manufactures, tea and cotton manufactures have not shown much progress. The chief commodities India now imports are machineries, iron and steel, petroleum, fertilizers, transport equipments, chemical elements, non-ferrous metals, paper and medicines. These goods form about 65 per cent of total imports. During first two plan periods, there was a large-scale import of machineries and raw materials. Now the picture has got somewhat changed. The import of fertilizer, crude minerals, iron and steel and petroleum increased sharply from 3 per cent in 1950-51 to 37 per cent in 1975-76. The Table II gives the commodities involved in the India's foreign trade and the change in the flow.

India has regular trade links with many countries. The most important trade partners are United States, Soviet Union, Japan, United Kingdom, Iran, West Germany, Saudi Arabia, Iraq and Canada which account for 56 per cent of India's Foreign trade. India's trade is now fast increasing with the countries of

TABLE II

Principal Commodities of Export and Import

Commodity	Per cent of Total Value of Export in		Commodity	Per cent of Total Value of Import in	
	1950-51	1975-76		1950-51	1975-76
Sugar ...	0.02	11.98	Petroleum crude ...	—	20.39
Engineering goods ...	—	10.36	Machineries ...	10.26	10.94
Jute manufactures ...	18.77	6.23	Fertilizer ...	—	8.42
Tea ...	13.30	5.98	Iron and Steel ...	2.20	5.92
Handicrafts ...	—	5.68	Chemicals ...	1.42	3.43
Leather goods ...	4.29	5.65	Transport equipments ...	5.37	2.52
Iron Ore ...	0.03	5.42	Non-ferrous metals ...	1.00	1.47
Cotton manufactures ...	24.15	4.93	Paper ...	1.55	1.09
Fish ...	0.41	3.21	Fruits ...	1.46	1.03
Cashew Kernels ...	1.42	2.43	Medicines ...	1.53	0.70
Tobacco ...	2.34	2.36	Crude minerals ...	—	0.56
Oil Cakes ...	—	2.18			
Chemicals ...	—	2.14			
Spices ...	4.24	1.80			
Iron and steel ...	—	1.73			
Coffee ...	0.22	1.69			

Persian Gulf. Table III gives the details of India's trade with some selected countries. India exports jute manufactures, cashew kernels, fish, cotton fabrics, sugar, spices and tea to United States and imports wheat, machineries, iron and steel, raw cotton, chemicals, transport equipment and fertilizers. Japan is the most

TABLE III

India

1975–76—Direction of Foreign Trade—Selected Countries

Countries	Per cent of total exports	Per cent of total imports
1. United States of America	12.88	5.23
2. Japan ...	10.83	6.87
3. Soviet Union ...	10.47	5.73
4. England ...	10.23	5.20
5. Iran ...	6.87	8.90
6. West Germany ...	2.99	6.91
7. France ...	2.13	3.59
8. Iraq ...	1.64	4.80
9. Bangladesh ...	1.58	0.09
10. Saudi Arabia ...	1.50	5.62
11. Nepal ...	1.28	0.61
12. Australia ...	1.21	1.96
13. Kuwait ...	1.15	1.21
14. Canada ...	1.07	4.41

important buyer of ores of iron, manganese and chromite from India. Among the neighbouring countries, India's trade is significant with Burma, Sri Lanka and Nepal.

Trade Policy

The trade policy refers to the government measures regulating the imports and exports of goods and services. India tried to evolve an effective trade policy only after independence. It rejected

free trade policy and protected the indigenous industries through a variety of controls. From second Five-Year Plan onwards, the main emphasis has been on export promotion and import substitution and to achieve this, a number of export councils were established. Besides these steps, India has succeeded in forming 'rupee areas' by reaching bilateral agreements with some countries, one of which is U.S.S.R. Those agreements have reduced to some extent the pressure on foreign exchange resources of the country.

With the aim of evolving a co-ordinated set of policies on trade, to be adopted by the governments, the United Nations General Assembly established an organisation called United Nations Conference on Trade and Development (UNCTAD) in 1964. The UNCTAD is now with 154 member countries and is meeting every four years. In 1968, it met at New Delhi. It has five main committees, dealing respectively with commodities, manufactures, shipping, finance related to trade and transfer of technology. It presently tries to formulate a programme of global action to improve market structures in international trade of developing countries.

CHAPTER IX

WORLD ECONOMY

Ours is a dynamic world. There is a process of continuous change affecting not only man but also the physical features of the world. The dynamism of Economic Geography rests on the pivot, namely man and his activities. Everywhere and in every action man plays the central role. In ancient period man was a slave to nature and was unable to overcome the difficulties posed by it. Slowly, the horizon of his knowledge widened and man was first able to adjust himself with the environment and then to modify it. It is to be noted that these vast changes have not taken place everywhere. Only in certain areas, the seed for development was sown and its spread to other parts was limited. This resulted in the differential development of different parts of the world. Man's level of culture is said to have a few stages. In the pre-historic period man was uncivilised and barbaric. Then he learned the art of hunting. When he learned the art of domestication of animals, he became a pastoralist. River plains made it possible for man to stay in a particular place for a long period of time. These plains also made his life easier and man got leisure, utilising which he was able to develop his knowledge and way of life. From sedentary subsistence agriculture, man developed commercial form of agriculture when large scale surplus was available. This necessitated trade and exchange. Industrial revolution made yet another contribution to the development of human culture. This industrial revolution led to the production of basic goods in large numbers at a cheaper rate. From industrial stage man has passed to the stage where trade and commerce have become the basis of the economy. As noted earlier, these developments have taken place only in some regions of the world. In others the development is either slow or lagging. Depending upon the economic development and depending upon the standard of living, we can divide the countries of the world into groups. Some countries have yet to attain higher stages in the economic development while some others have reached the higher stage already. We can identify the follow-

ing groups in general. For our discussion, we have not taken areas where people are still in the lower stages of culture. The major groups are:

(1) Under-developed or Developing countries.

(2) Developed countries.

Each of these is subdivided into two. The Developed countries are divided into two groups. (*a*) Developed countries with capitalistic economy—(First World) and (*b*) Developed countries with socialistic economy (Second World). The Developing countries were formerly under one group (Third World). But, recently, the significance of petroleum has brought some changes in the economy of some countries, particularly the Arab countries and so these come under a new category, namely, 'The Fourth World'.

The basic human needs have been made only more acute by the acceleration of technological gains and of population growth. The division of developed and developing countries has resulted largely from the impact of science and technology. While science and technology have notably contracted our world in one way, they have expanded the problems in another way. They have given man immense power not only over nature to some extent, but also over his fellow men, to a terifying extent.

UNDER-DEVELOPED OR DEVELOPING COUNTRIES

These countries comprise about 65% of the world's habitable area. They include countries in the continents of Africa, Latin America and Asia (with the possible exception of Japan). Most of these countries are painfully handicapped by excess of population and low standard of living. High illiteracy rate, lower sanitary and health facilities, constant battle against diseases, poverty and low life expectancy at birth are some of the other characteristic weaknesses of these countries. Even among these countries diversity is seen. In every type of geographical environment here are people with highly different creeds and cultures and in many stages of development. Some of these countries have a wealth of resources which have barely been tapped. Even though these countries are diverse in various aspects, they have at least one thing in common—their traditional ways of life have been seriously disturbed by the impact of the West's Industrial Revolution.

For countless centuries, the people in these countries accepted their lot like a saint without pain or pleasure. But today, they are apparently determined to share the better life of the people living in the developed countries. These people now refuse to regard their poverty as inevitable; they demand to have some control over their destiny. In most cases, the majority of the people are aroused of these possibilities. Most of the rural people have barely broadened their horizons beyond the elemental desire for sufficient land to sustain their families and for freedom from heavy debt. But the leaders of the nations have become aroused over the possibilities of transforming the societies through technology and science that made the Western countries wealthy and powerful. In the case of Western countries, the industrial advancement happened on trial-and-error method for about a period of hundred years. But these leaders of the Third World expect and insist upon telescoping the transformation in a few decades. These leaders want to imitate the western economic and social advances. Thus, a revolution of rising expectations is sweeping like a tidal wave over these lands. The leaders of some of the nations have a deep desire for economic self-sufficiency. Yet the interdependency of the world is an outstanding phenomenon of the present day. Even gigantic countries like the Soviet Union, the United States of America etc. cannot meet, economically at least, all their requirements for food and raw materials.

The following are some of the reasons for the under-development of some countries. They are: (1) Often the economies of these countries are tied to a single product of crop (monoculture). (2) Frequently, restrictive trade practices discourage governments from investing in new export lines as a means of earning more foreign exchange; the economies of these countries are, accordingly, subject to the ups and downs of a market determined elsewhere. (3) Often these countries are over-populated with respect to their natural resources base. (4) These countries lack capital, machinery and technological know-how and (5) The social system often is static and rigid.

Invariably under-developed or developing countries believe that improvement in their conditions lies in industrialisation. Hence, all over the world efforts are being made to improve manu-

facturing industries. Let us pass on to an individual account of the different continents and the problem of these continents regarding economic development.

1. Asia

The largest of all continents, Asia is often termed as a 'continent of contrasts'. Diversities are there not only in climate, relief, soil, vegetation, etc. but also in the social set up, customs, culture and habits of the people. Asia alone comprises about 65% of the world's population and distribution of population again is quite uneven. But amidst the diversities, most of the Asian countries have a few common elements. They are:

(1) Agriculture is the mainstay of the economy in most of the countries. (2) Most of the Asian countries got their independence after Second World War before which they were colonies of European countries. With the exception of some countries like Philippines, Japan and China, almost the whole of Asia was under European colonization till 1945. (3) Almost all the countries suffer from an exhorbitant growth of population. (4) Even before the onset of European colonization, most of the people in Asia had evolved to advanced stages of very different culture.

Favourable climate and other geographical conditions were responsible for enough production of food grain in Asia before Industrial Revolution. A glance at the growth of world population indicates that the population explosion is a phenomenon after Industrial Revolution. The last two hundred years saw an unparallelled development in the field of science, health and technology. The development in the field of health and medicine led to the lowering of death rate. The European colonization was responsible for the spread of this medical knowledge to the Asian countries where the Birth and Death Rates were high. Because of this the death rate was lowered while birth rate remained high leading to sudden increase in population. As the population was already large, even a small amount of decline in the death rate led to large increase of population numerically. It is to be noted here that in the so-called developed countries population was not much compared to the Asian countries. This factor is of fundamental significance for the differential levels of economic development.

Impact of colonization was a factor responsible for the slackening development of the economy. One of the main reasons for European colonization is to find raw materials for the industries particularly for the cotton textile industry. Hence the colonists like the British made their colonies raw material exporting areas thereby crushing the indigenous industry. To give an example, we can take the cotton textile industry in India. India in the past was famous for the production of cloths such as calico and muslin. These cloths were produced mainly by the handloom industries. As the United Kingdom needed raw cotton, India was forced to export raw cotton and indigenous industries were crumbled. The Europeans not only exploited their colonies but also flooded the markets of the colonies with their products. Only after independence these countries even had a chance of improving their industries and stabilizing their economy. Industrialization programmes are underway throughout Asia against the competitive background of a struggle for leadership between the communist and free enterprise societies.

(*a*) *South-east Asia:* Politically, South-east Asia comprises of countries to the East of India and to the South of China. A look at the physical map of Asia, can clearly give us the fact that most of the countries (Burma, Thailand, Malaysia, Indonesia, Laos, Kampuchea, Vietnam and Philippines) are rugged and mountainous. As these regions experience heavy rainfall, vegetation growth is rapid. The only habitable areas are the river valleys and coastal plains. As indicated earlier most of the countries got their independence only recently. There are severe setbacks for the development of manufacturing industries. Hence most of the countries depend on primary activities for their economy. Rice, sugarcane, rubber, spices and coconut are important agricultural crops while the minerals include tin, petroleum, tungsten, etc. Because of the abovesaid conditions, these countries remain at a lower stage of economic development. Nationalisation of rubber plantations in Malaysia may give a chance for the development of that country. As such, there are limited chances for industrial development here.

(*b*) *East Asia:* With the exception of Japan, East Asia comprises of China, Taiwan and Korea. Taking the People's Republic of China, before the so called 'Cultural Revolution' dependence on

agriculture was much. But of late China has advanced in the fields of science and technology particularly in the basic industries. The non-availability of sufficient statistics make it difficult to ascertain the level of economic development. Here again there is little contribution to the world trade from this region regarding manufactured goods, with the exception of textiles.

(*c*) *South Asia:* India is one of the developing countries which stands far ahead than the other developing nations in terms of economic development. A country of long cultural tradition, India suffered a lot because of varied influence. Though the country has enough resources, the social set up and the British overrule made it impossible to utilise the resources to the maximum. After independence, however, India is able to develop her economy with the help of Five Year Plans. The rapid growth of population hindered all development. In spite of the steps taken by the government, agriculture still is in the traditional method and dependence on monsoon still tosses agricultural activities. Because of Five Year Plans and the various steps taken by the government like Green Revolution, Integrated Rural Development, India is able to attain at least self-sufficiency in the production of food grains at present. Though not in all industries, advancements can clearly be seen in certain industries particularly the textiles, heavy electricals etc. Still it is a long way for India to reach a stage of economic development comparable to that of the West. Regarding the other nations of South Asia, Afghanistan has limited resources being a mountainous country. Aridity in Pakistan restricts development there. Bangladesh is struggling to maintain political stability rather than economic stability. Sri Lanka tries to develop her agricultural potential rather than her industries. So these countries will remain backward at least in the near future.

(*d*) *South-west Asia:* This region includes countries to the west of the Indian sub-continent. Most of the regions are semi-arid or arid. Hence chances for economic development are few. Iran, Iraq, Turkey and other countries have only limited agricultural resources. The most important resource of this region is petroleum. Accounting for roughly 58% of the total petroleum reserves, the Arab countries threaten the world with oil weapon. The entire economic structure leans so heavily on oil that the Arab countries

were able to mint money. As the world is barely in need of oil, these countries can raise the price of crude oil thereby increasing their foreign exchange. Because of abundant increase in their stocks, these countries are trying to improve other activities. For example, Saudi Arabia is trying to build plants which can harness the solar energy for various purposes. In other parts of the world, such schemes are left as not feasible because of high investment. In these countries, oil money is responsible for the location of such plants. The future of the world, at least till the end of this century depends on oil and because of this, these countries have gained extraordinary significance. They are now grouped together and are called 'The Fourth World'. They show an example of economic development which is the result of a primary product, namely oil. In no other part of the world, we get an analogy for this.

In short, only a few countries in Asia can attain higher stages of economic development in the near future.

2. Africa

Africa is often referred to as the 'continent of future'. African nationalism is now marking the final stages of European colonialism. There are three Africas, superimposed one upon the other—the alien European Africa, the tribal 'African's Africa, and the new nationalist African republics. Much of Africa, with the exception of the northern border, was practically unknown till the present century. It was aptly called a 'Dark Continent'. The reasons for the inaccessibility include large stretches of hot deserts, rugged plateaus, dense equatorial jungles and above all hostile and primitive tribal people. Africa is one of the areas of greatest change in the present-day world. Need for labourers in the New World and the local unfavourable conditions were responsible for large scale slave trade from Africa. The climate of a greater part of the interior Africa is unhealthy, specially for Europeans who initiated the exploration of Africa. There have been no attraction of exceptionally fertile agricultural lands or rich mineral deposits (except gold and diamonds in the south) which would induce to overcome difficulties. There are also problems of insects, parti-

cularly the tsetse fly. These are all some of the reasons for the economic backwardness of Africa. Even though, she is the second largest continent in area, she is the last among all the continents in the volume of trade and production. The few attractive areas in Africa include the Nile valley in the north and part of South Africa which has precious minerals like gold and diamonds. South Africa alone accounts for roughly 70% of the total gold produced in the world. Similarly Africa accounts for a major share in the production of Platinum, Cobalt, Phosphate, etc. Congo, South Africa, Rhodesia and Nigeria are important countries for the production of the abovesaid minerals. Among the agricultural crops cocoa, coffee, rubber, tobacco, cotton, sugarcane and groundnuts are important. Commercial agriculture is practised in parts of Ghana, Nigeria, Guinea, Tanzania, Kenya, Uganda, Rhodesia and South Africa.

Africa is beset by problems of enormous magnitude. These problems include harsh and unyielding environment, diseases, illiteracy, rapid growth of population, low per capita income and the slowest rate of economic growth. Africa with about 8% of the world's population produces less than 2% of the world's goods and services. The situation is worsened by the tendency of the industralised countries to exploit Africa as a source of cheap raw materials. The problems of Africa would be closer to solution were it not for racial, cultural, tribal and political differences. Intense rivalries have developed among the countries because of the abovesaid differences. Africa is a 'power vacuum' and super powers battle to control Africa. Many of Africa's problems could be lessened if more capital were available for development. Unfortunately, each nation has very little surplus in the way of domestic savings and the amounts of foreign aid are also too small. It is chiefly in mineral exploitation, where there are quick and handsome returns to be made, that private capital has been induced to invest large amounts in Africa.

To conclude, Africa has vast potential but lacking proper care and development. If the advancements in science and technology are properly utilised, Africa will become an important economic region in future.

3. Latin America

The term Latin America refers to all the countries in the New World to the south and south-east of the United States. This includes countries in Carribbean America and in South America. Much of Latin America came under the influence of the so called 'great migration' of the 16th and 17th centuries. Latin America can be subdivided into two—Middle America and South America.

Both the name of the region and the way of life reflect the significance of culture traits inherited from the Latin-European nations of Spain, Portugal and France. Spanish, for example, is the official language in 18 of the 24 independent states. In several countries, however, more than one language is in use.

(*a*) *Middle America:* It is that portion of the New World located south and south-east of the United States and north of South America. It includes Mexico, Central American countries, and the West Indies. Latin America is the continent which experiences the fastest rate of growth of population. As said earlier, these countries were mostly under colonial rule, with the result that they still are backward in the economy. Agriculture dominates the economic life of all parts of the region. The Middle America has some common elements. They are:

(1) High rate of population increase.

(2) Low income level.

(3) Heavy reliance on primary activities particularly agriculture.

(4) Export of only one or two products to one or two trading partners. This makes the inhabitants of Middle America highly vulnerable to changing economic conditions in the countries with which they trade.

Agricultural types vary from area to area. But nearly all types are characterised by low yields and dependence on manual labour. So per capita income is low. Unless the farmer finds ways to increase his output, for which there is little scope, his purchasing power is substantially decreased and he must accept a lower standard

of living. Bananas, sugar, coffee, cotton, etc. are the important products of this region. The above account gives us the conclusion that except northern and central Mexico, other parts have little chance for economic development. Mexico is very important for minerals, particularly lead, zinc, silver and petroleum. Jamaica is one of the world's leading producer and exporter of bauxite.

Middle America is in the process of fundamental change. Manufacturing opportunities are limited by a lack of local raw materials, energy supplies and local markets. The countries of Middle America have grouped themselves into different trading blocks to promote trade and economic development.

(*b*) *South America:* With the exception of Argentina and Uruguay, other nations of South America experience high rates of population growth which will shape the economic development of these countries for decades to come. For centuries and still today, a host of primary agricultural, forest and mineral commodities have been bases for commercial interaction between South American nations and their industrialized neighbours. Resource exploitation is limited by a lack of transport facilities because most parts of the continent are having unfavourable terrain. As a world region, South America is characterised by spectacular conditions and contrasts; hot, humid tropical forests, deserts where rainfall is all but unknown, mountains higher than anywhere but Asia, vast river plains and a poverty of material goods for societies rich in tradition.

The majority of the people of South America are still tied closely to the land. South America is a provisioner of tropical agricultural products, and mid-latitude grains and livestock commodities of world wide significance. Agricultural products of importance include bananas, coffee, sugar, wheat, corn and rubber. Manufacturing is largely a development of the past 40 years.. Minerals include copper, nitrate, iron ore, bauxite, petroleum and silver. Argentina is famous for livestock products such as wool, beef, mutton and dairy products.

Agriculture and manufacturing can make South America prosperous. Perhaps the most critical challenge clouding South America's future is the matter of property whether ownership of

land will change or not is the question to be answered. During nearly two centuries of independence, many of these people have been unable to evolve modern societies or to organize their economies by their own efforts. What the future holds remains to be seen; but there can be no question that change is on the horizon.

THE DEVELOPED COUNTRIES

The last two hundred or three hundred years are the most important period in the history of mankind. The present-day developments in all the fields was a product of this era. The Industrial Revolution formed the base above which the modern economy is constructed. Western Europe, particularly the United Kingdom was the source from which the developments radiated to the colonies. Among the developed countries, we will first see the Western European countries, Australia and New Zealand, Japan and the United States of America and Canada. Then we can give an account of economic development of the Socialist countries including the Soviet Union.

1. Western Europe

There is considerable controversy regarding the delimitation of Western Europe. However, here we take into account all the European countries with the exception of the Socialist countries of Eastern Europe. The most important country here is the United Kingdom. A pioneer in many fields, the United Kingdom led the world in the fields of science and technology. It is an apt remark if we say that the present-day advancements have originated from the United Kingdom. The Industrial Revolution of the United Kingdom made it possible the comforts of modern world. Next in importance is West Germany. The countries of the north-western Europe have declined relatively in world significance, partly as a result of their loss of colonies and partly because of the economic development of other countries, particularly the United States and the Soviet Union. This region accounts for a major share in the production of manufactured goods. This region accounts for about 46% of the total world imports and 42% of the exports. The central location of this area in the land hemisphere facilitates

world trade. The skills of the people combined with their concentration largely in cities, make this region of major economic importance to the world. After the great age of exploration, the Western European countries dominated the world for centuries exploiting the resources of their colonies. This led to the economic development of these regions. Agriculture is secondary to manufacturing here. This region is important for agricultural crops such as wheat, barley, rye, oats, sugar-beet, fruits, etc. Among the manufactured goods iron and steel, motor vehicles, heavy machinery, chemicals, etc. are produced in large quantities. The contribution of Western Europe to the advancement of world civilization has been great. Today, most European countries are prosperous and they enjoy a high standard of living. Besides manufacturing and agriculture, this region is also important for dairy products, fisheries and forest resources. The diversity of resources, the technical skill of the people and large concentration of urbanised people with high standard of living make Western Europe a region with no comparable region of equal significance in the world.

2. Australia and New Zealand

Both these countries are the product of British Colonization and are strongly British in ancestry and culture. Both these countries have exceptionally high standards of living. Basic to the economy of both countries are exports of a few primary products like wool, dairy products, meat, wheat, bauxite, iron ore, etc. These land areas have been remote from the rest of the world from time immemorial. But now this isolation has disappeared. The limited population and vast resources make these areas to have more potential for future development.

3. Japan

The only country in Asia to have equal status to the Western industrial nations, Japan is a major contributor of manufactured goods and agricultural crops. Problem of over population affects the economy of Japan as in the case of other Asian countries. Agriculture still is one of the major occupations of the people. Rice is the staple crop. But arable land is so much restricted that Japan has to depend on imports. This is one of the reasons for

the necessity to develop manufacturing industry. By exporting manufactured goods, Japan can import foodstuffs. Even though Japan is industrially well advanced, it depends on other countries for raw material supply. Japan's industrial output is growing faster than any other country in the world. Because of advanced farming technique and industrial progress, Japan has the highest standard of living in Asia.

4. The United States of America and Canada

The United States, no doubt is the leading country in the world in terms of total share in the production of various commodities and in the standard of living of the people. The limited population, vast resources which are being exploited only for the past three centuries and the technical know-how supplied by the people who came from Europe and settled here are responsible for this leadership. The resources here are not only abundant but also varied in nature. The per capita arable land is very high in Canada. The vast size of these countries and comparatively little population, and the various types of climate due to large latitudinal extent made it possible for these countries to produce plenty of agricultural products much of which is exported. The abundant mineral wealth, particularly of coal, petroleum, natural gas, iron ore, copper and nickel accelerated the industrial advancement. The region accounts for about 30% of the total steel, 50% of the total aluminium, 50% of the total motor vehicles and about 15% of the total cotton textiles produced in the world. On the whole, the economic production per person involved is the highest here than any other part of the world. Large scale mechanization, better transport facilities and high per capita income are responsible for the high standard of living. In the case of Canada, the vast resources and low population made it possible for the people to enjoy high standard of living. This region, particularly the United States, is dominating the world economy for the past few decades and this leadership will continue at least in the near future.

5. Socialist Countries

The Soviet Union and East European countries are collectively called 'The Socialist Countries' or 'The Second World'. These

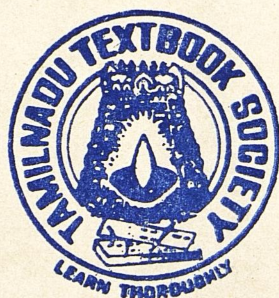
countries differ from the other developed nations in the basic structure of their economy. Here every resource is the property of the state.

(*a*) *The Soviet Union:* In a period of less than 50 years, the Soviet Union has risen to a position of world industrial importance second only to the United States. The Soviet Union ranks first in size among the countries of the world. It is nearly larger than South American continent in area. The Asiatic part of the Soviet Union, often referred to as Siberia, differs from the European section in many characteristics. The European part of the Soviet Union is densely populated, industrially well advanced and agriculturally fertile. The difference between the economic development of other parts of the world and the Soviet Union lies in the fact that all the resources are the property of the State. Since the Bolshevik Revolution, the Soviet Union has been transformed into a major world power. Agriculture, though important in the economy, lags behind industry and fails to satisfy the domestic requirements. Current data analysis indicates the supremacy of the Soviet Union over the United States, particularly in the production of wheat, steel, fabrics and cotton. The economic advancement is found only in the European parts of the Soviet Union. At present, the Asiatic section provides the raw materials for the economic core area in the west. Unfavourable climate, presence of permanent snow-cover, distant location, lack of transportation and rugged terrain restrict the development of Asiatic section. It is estimated that Siberia alone has more coal and iron ore, than the rest of the world put together. The mineral wealth of Siberia is abundant. As observed, the future of the world depends on Siberia which is the 'frozen treasure house'.

(*b*) *Eastern Europe:* The seven countries of Albania, Bulgaria, Czechoslovakia, Hungary, Poland, Rumania and Yugoslavia comprise the Eastern Europe. This area is the central core of the European peninsula. Eastern Europe was for long the chosen war arena of its powerful neighbours—the more populous unified and powerful German and Russian realms. The small and weak states of this region looked to powerful allies for security and redress. After World War II, these countries were brought under communist control of the Soviet Union. Contrasting areas and cultural

diversity are the notable characteristics of Eastern Europe. All the peoples of Eastern Europe were deeply involved in the two World Wars and suffered the total consequences of physical and spiritual devastation and degradation. All the countries made remarkable strides in their postwar recovery and technological advances. The Council For Mutual Economic Assistance (COMECON) promotes closer ties between the countries of Eastern Europe and the Soviet Union. Czechoslovakia and Poland lead the other countries in the production of manufacturing goods. This region is large and diverse in area. Agricultural and mineral wealth are also rich here. Nature is far kinder here than the impact of power struggle over the economic development of these countries.

The preceding account has given us an idea about the varied economic set-ups in various parts of the earth. It is clear that the resources and other potentials of the earth are unevenly distributed. This makes the countries of the present-day world to interdepend on each other. The world is as varied as the nature of people who live in it. This interdependence seems to be the binding force cementing the various countries with the result that 'One World' concept in terms of living standards, has become the slogan of the day.


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